

TEST RESULT SUMMARY

FCC Part 15 Subpart E Section 15.407 Industry Canada RSS-210 Issue 7 Industry Canada RSS-Gen Issue 2

MANUFACTURER Digi International
11001 Bren Road East
Minnetonka MN 55343

PRODUCT NAME Wi-EM 9210 a/b/g

MODEL NUMBER(S) TESTED 50001558-01 with 29000147 antenna

PRODUCT DESCRIPTION 802.11 a/b/g embedded radio module (802.11 a/b/g to a serial port converter module) with PCB antenna

TEST REPORT NUMBER WC807706.2 Rev C

TEST DATE(S) 15 September 2008 – 26 March 2009

TÜV SÜD America Inc, as an independent testing laboratory, declares that the equipment tested as specified above conforms to the applicable requirements of parts of Subpart E, Section 15.407 "General technical requirements" and Industry Canada RSS-210 Issue 7 "Low-power Licence-exempt Radiocommunication Devices (All Frequency Bands): Category 1 Equipment" and RSS-Gen Issue 2 "General Requirements and Information for the Certification of Radiocommunication Equipment"

It is the manufacturer's responsibility to assure that additional production units of this model are manufactured with identical electrical and mechanical characteristics. Any modifications necessary for compliance made during testing on the above mentioned date(s) must be implemented in all production units for compliance to be maintained.

Date: 16 November 2009

Tested by:

Approved by:

Location: Taylors Falls MN
USA


Greg Jakubowski
Senior EMC Technician


Joel T Schneider
Senior EMC Engineer

Not Transferable

EMC TEST REPORT

Test Report No. WC807706.2 Rev C Date of issue: 16 November 2009

Product Name Wi-EM 9210 a/b/g

Model / Serial No(s) Tested 50001558-01 with 29000147 antenna / 0000x

Product Description 802.11 a/b/g embedded radio module (802.11 a/b/g to a serial port converter module) with PCB antenna

Manufacturer Digi International
11001 Bren Road East
Minnetonka MN 55343

Test Result **Positive** **Negative**

Total pages including Appendices 73

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REVISION RECORD

REVISION	TOTAL NUMBER OF PAGES	DATE	DESCRIPTION
	92	10 February 2009	Initial Release
A	106	03 April 2009	<ul style="list-style-type: none"> - Max conducted output power; Described test method used in test summary Replaced channel 34 data with channel 36 Added mid channel data, channels 42, 56, 60 Replaced previous plots of remaining channels - Peak power spectral density; Replaced channel 34 data with channel 36 Replaced all channel plots. Now with correct VBW. Added note in summary about pk spectral density vs. avg - Peak excursion; Replaced channel 34 data with channel 36 Added mid channel plots, channels 42, 56, 60 Added trace 2 description - Emission bandwidth; Replaced channel 34 data with channel 36 Added mid channel plots, channels 42, 56, 60 - Undesirable emission; Added manufacturer's duty cycle data Replaced channel 34 bandedge plot with channel 36
B	106	22 July 2009	<ul style="list-style-type: none"> - Corrected duty cycle calculations to match the manufacturer's data - Revised data table for maximum conducted output power - Added descriptions to 5.15 GHz & 5.35 GHz bandedge plots describing peak/average compliance in restricted bands
C	73	16 November 2009	<ul style="list-style-type: none"> - Corrected duty cycle information for undesirable emissions to reflect manufacturer's recommended 10% worst case duty cycle scenario. - Removed all reference to mid bands, 5250-5725 MHz

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EMC TEST REGULATIONS:

The tests were performed according to the following regulations:

- FCC Part 15 Subpart E Section 15.407 Paragraphs (a), (b)
- Industry Canada RSS-210 Issue 7 Sections A8.2(a), A8.4(4), A8.5, A8.2(b), A9.2, A9.3
- Industry Canada RSS-Gen Issue 2 Section 4.6.1



ENVIRONMENTAL CONDITIONS IN THE LAB

	<u>Actual</u>
Temperature:	: 20-24°C
Atmospheric pressure	: 98-100kPa
Relative Humidity	: 28-62%

POWER SUPPLY UTILIZED

Power supply system : 3.3VDC

TEST EQUIPMENT

All measurement instrumentation is traceable to the National Institute of Standards and Technology and is calibrated according to internal procedure.

SIGN EXPLANATIONS

- not applicable
- applicable



Maximum conducted output power FCC 15.407(a), IC RSS-210 A9.2

Test summary

The requirements are: - MET - NOT MET

Testing was performed in accordance with the test procedure of FCC Public Notice DA 02-2138 method #1.

Span > EBW, bin width < 1/2 RBW therefore sample detector, device operates continuously therefore trigger = free run, average 100 traces in power avg mode.

Computed power by integrating the spectrum across the 26 dB EBW using the analyzer's band power measurement function.

Maximum conducted output power is 9.67 dBm or 9.29 mW, channel 48, 5.24 GHz

Minimum margin of compliance is 6.93 dB, channel 48, 5.24 GHz

Test location

- Wild River Lab Large Test Site (Open Area Test Site)

- Wild River Lab Small Test Site (Open Area Test Site)

- Wild River Lab Tech Area, conducted measurement

Test equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Due
WRLE03334	8542C	Giga-tronics	Peak Power Meter	1831096	18-Mar-10
WRLE03335	80350A	Giga-tronics	Peak Power Sensor	1828549	18-Mar-10

Test limit

Frequency Band (GHz)	Limit (mW)	Limit (dBm)
5.15 – 5.25	50	17
5.725 – 5.825	1000	30

$10 \log(26 \text{ dB EBW(MHz)}) = 13$

Antennas are < 6 dBi gain

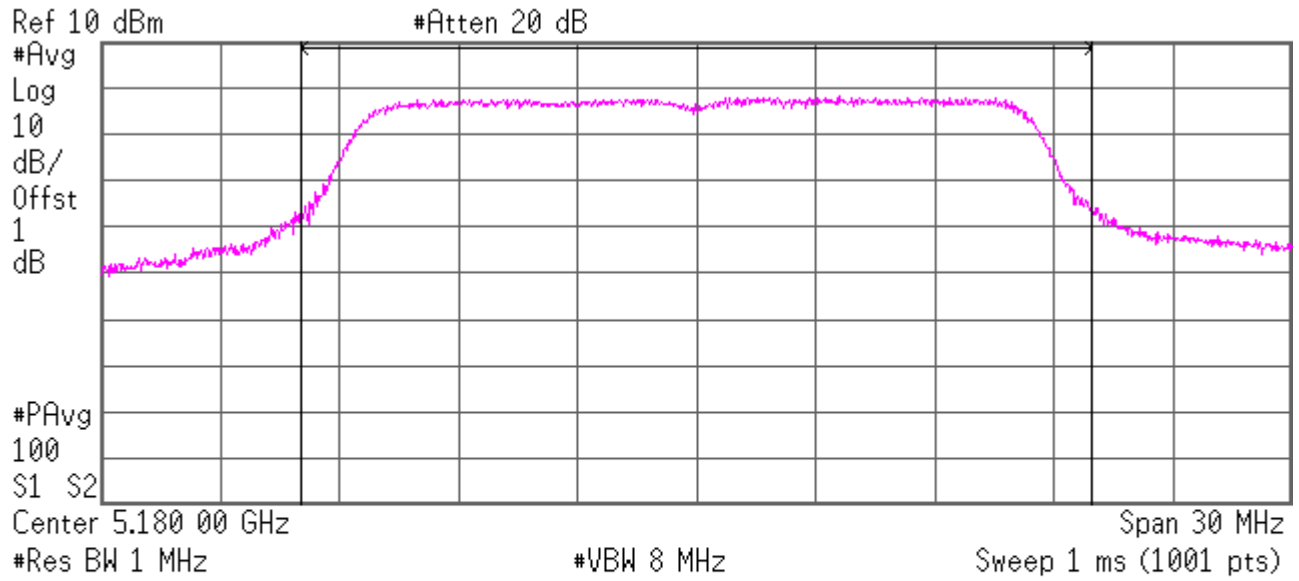
Test data

Ch	Freq (GHz)	Power (dBm)	Limit (dBm)	Delta (dB)
36	5.18	9.04	16.97	-7.93
42	5.21	9.31	17	-7.69
48	5.24	9.67	16.6	-6.93
149	5.745	8.48	29.7	-21.22
157	5.785	8.36	29.8	-21.44
161	5.805	8.06	30	-21.94

see following pages

Conducted output power
Channel 36, 54 Mbps, power setting 40

 Agilent



Channel Power

9.04 dBm /19.8600 MHz

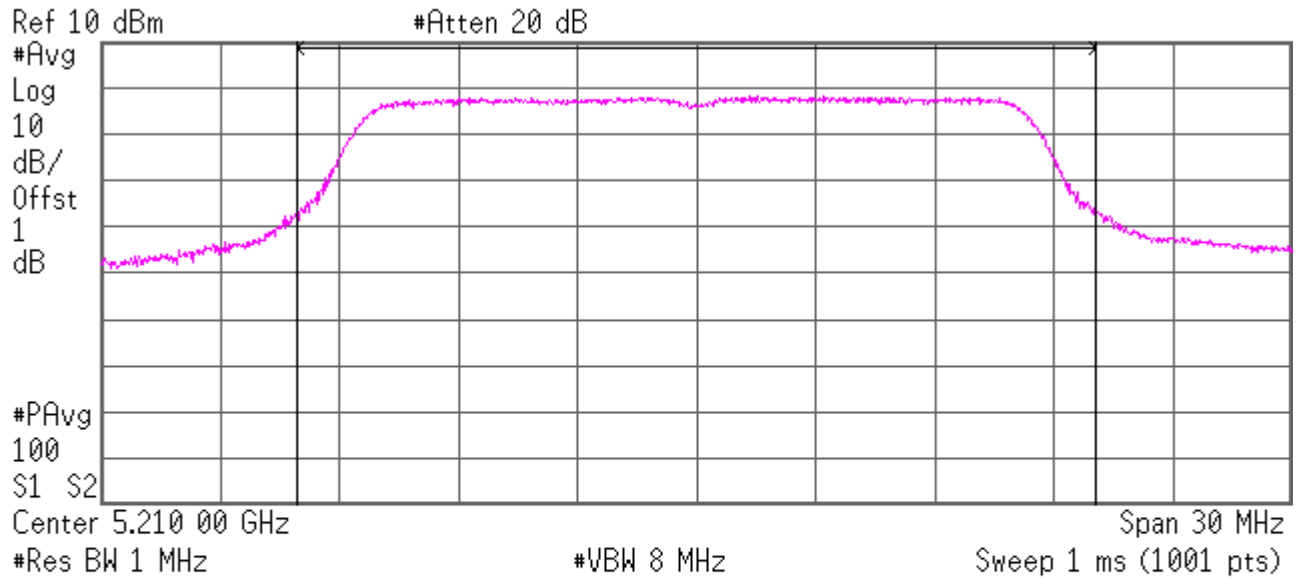
Power Spectral Density

-63.94 dBm/Hz



Conducted output power
Channel 42, 54 Mbps, power setting 40

 Agilent



Channel Power

9.31 dBm /20.1300 MHz

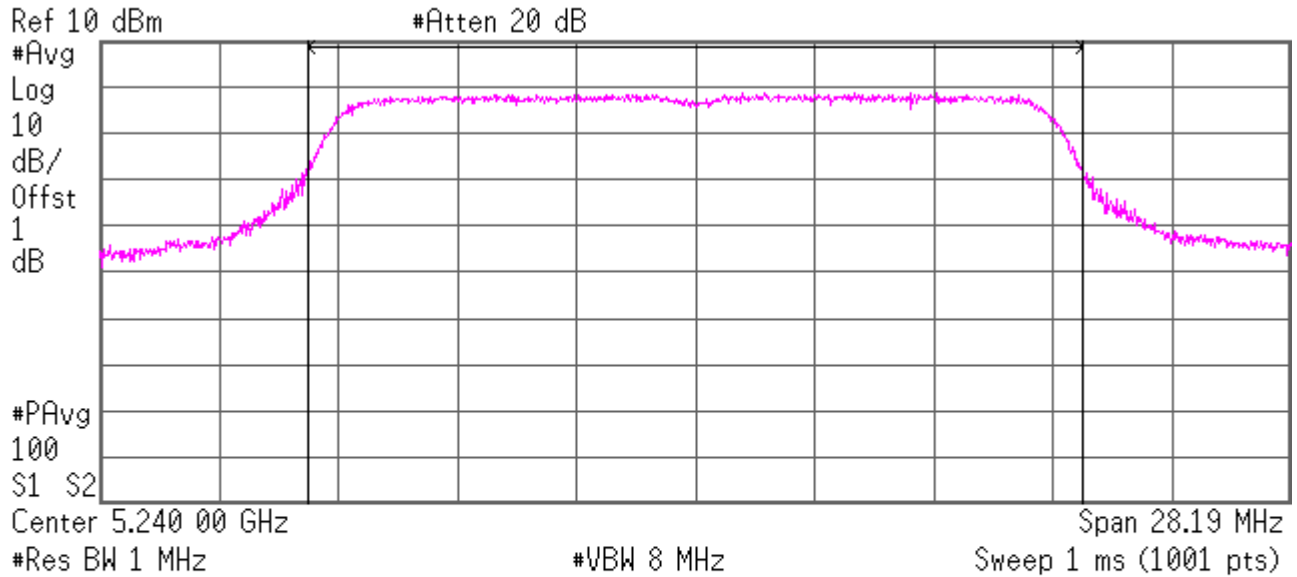
Power Spectral Density

-63.73 dBm/Hz



Conducted output power
Channel 48, 54 Mbps, power setting 40

 Agilent



Channel Power

9.67 dBm /18.2700 MHz

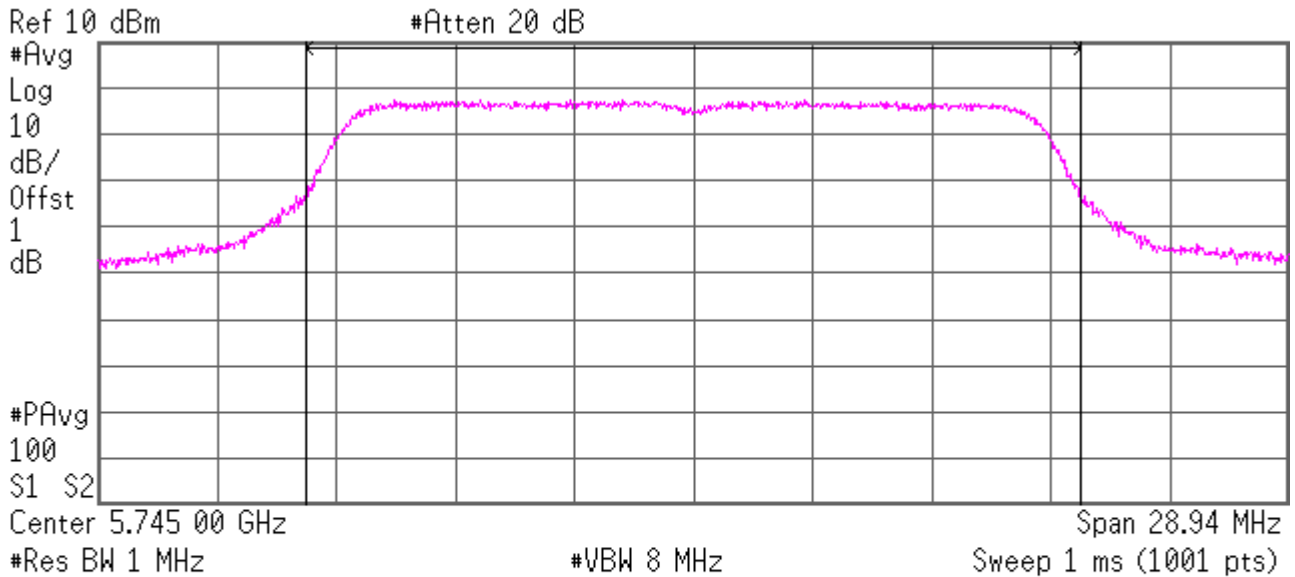
Power Spectral Density

-62.95 dBm/Hz



Conducted output power
 Channel 149, 54 Mbps, power setting 40

 Agilent

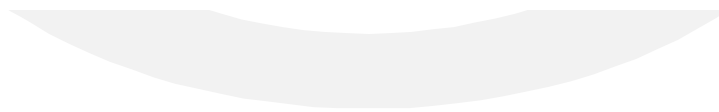


Channel Power

8.48 dBm /18.7500 MHz

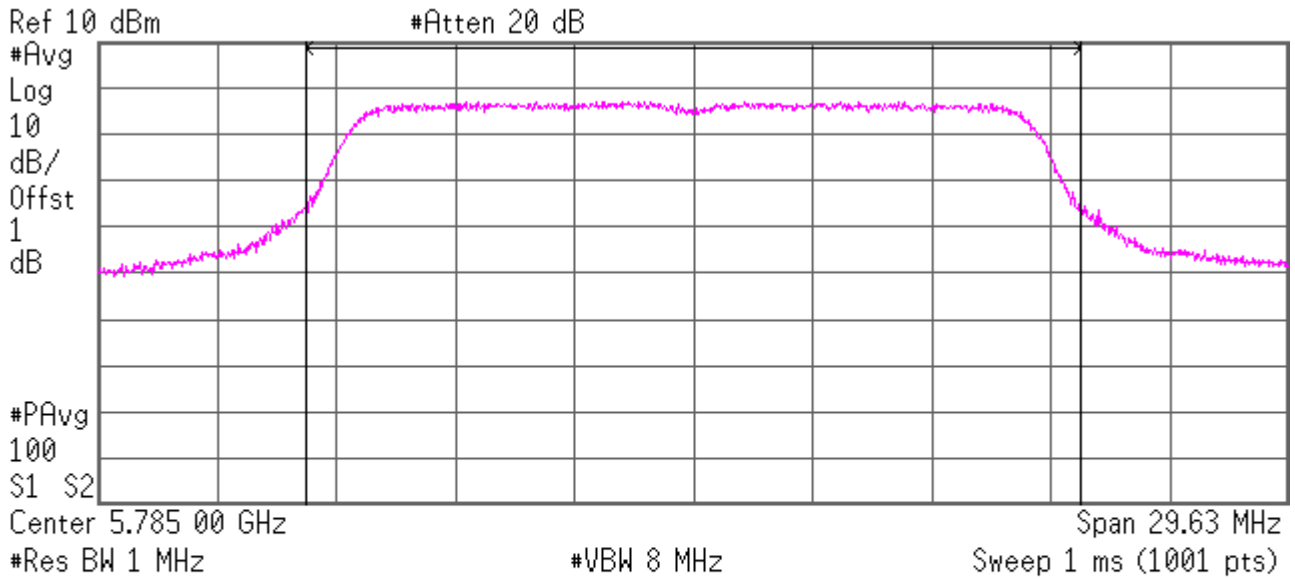
Power Spectral Density

-64.25 dBm/Hz



Conducted output power
Channel 157, 54 Mbps, power setting 40

 Agilent



Channel Power

8.36 dBm /19.2000 MHz

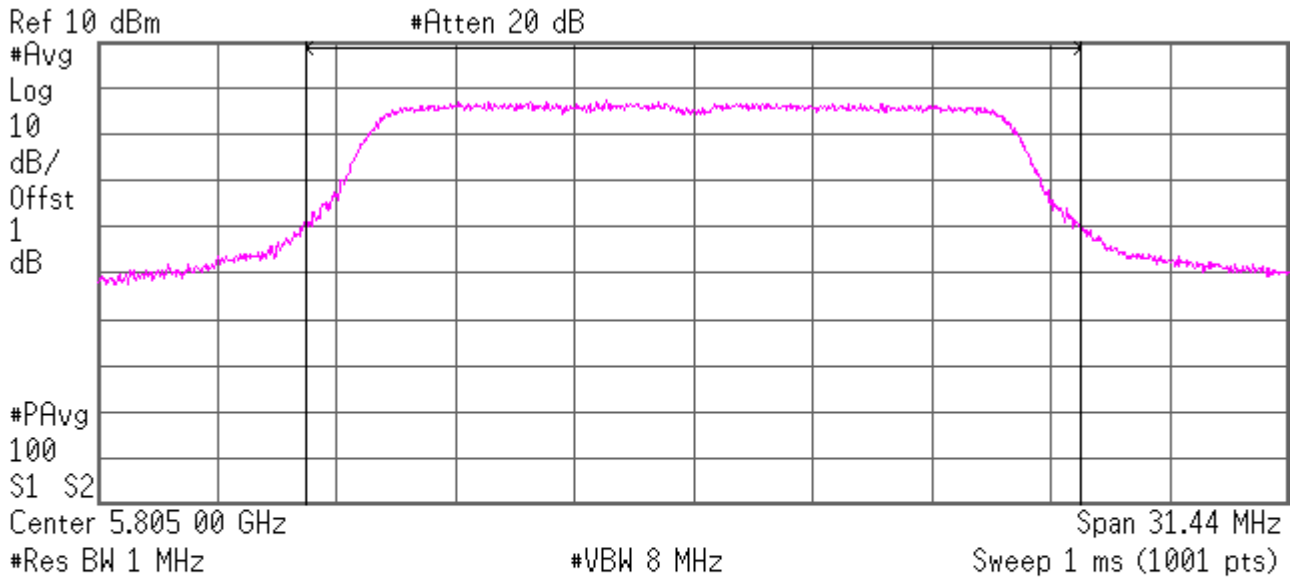
Power Spectral Density

-64.48 dBm/Hz



Conducted output power
Channel 161, 54 Mbps, power setting 40

 Agilent



Channel Power

8.06 dBm C20.3700 MHz

Power Spectral Density

-65.03 dBm/Hz



Peak power spectral density FCC 15.407(a), IC RSS-210 A9.2

Test summary

The requirements are: - MET - NOT MET

Testing was performed in accordance with the test procedure of FCC Public Notice DA 02-2138

Maximum PPSD is -1.77 dBm, channel 48, 5.24 GHz

Minimum margin of compliance is 5.77 dB, channel 48, 5.24 GHz

10 log (any 99% BW) > 0. All peak power spectral density values are < 0.

Each channel's peak spectral density per MHz does not exceed its average (10 log₁₀ B) value by more than 3 dB.

B has been defined above as the 99% emission bandwidth

Test location

- Wild River Lab Large Test Site (Open Area Test Site)

- Wild River Lab Small Test Site (Open Area Test Site)

- Wild River Lab Tech Area, conducted measurement

Test equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Due
WRLE03371	E4440A	Agilent	Spectrum Analyzer	MY43362222	11-Aug-10

Test limit

Frequency Band (GHz)	Limit (dBm/MHz)
5.15 – 5.25	4
5.725 – 5.825	17

Antenna is < 6 dBi gain

Test data

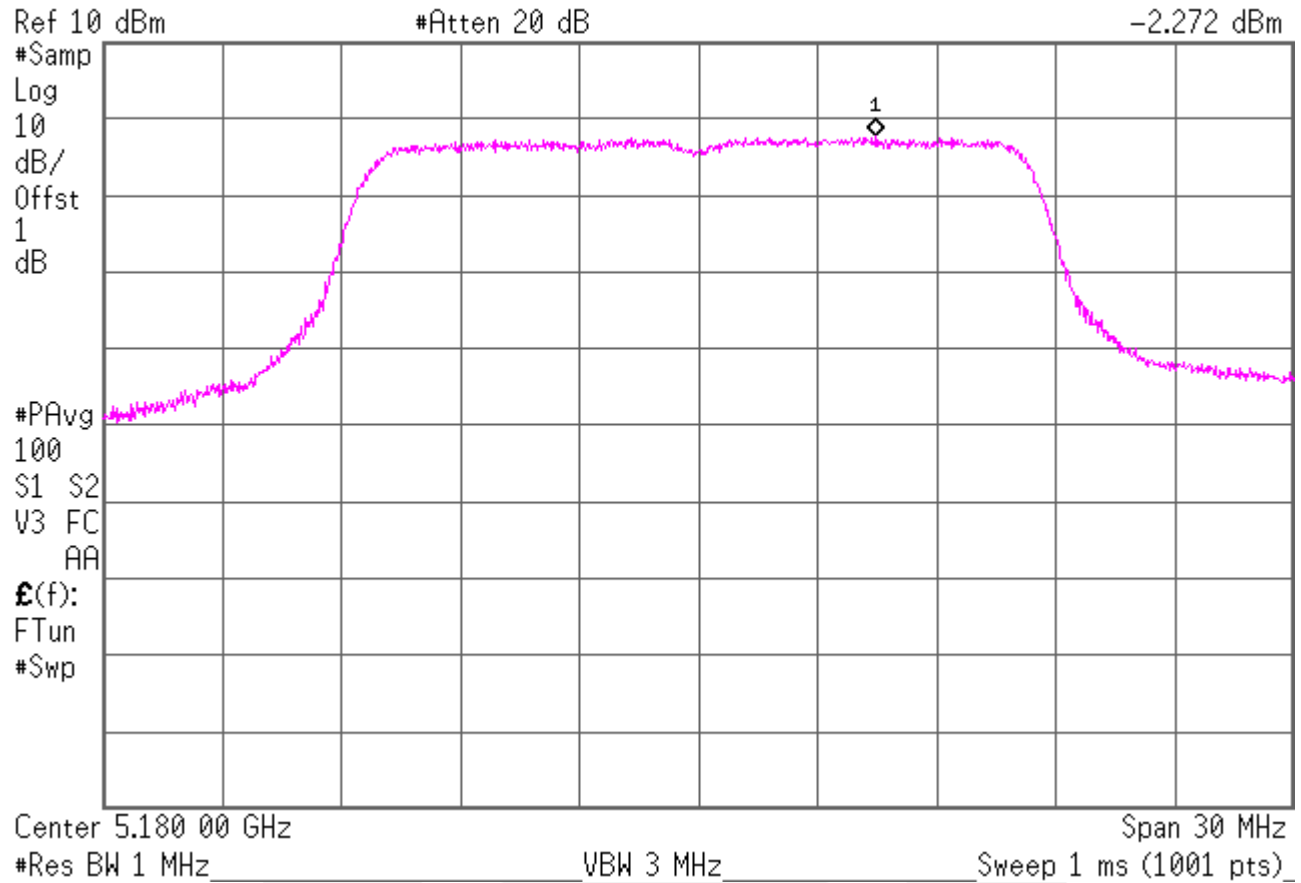
Ch	Freq (GHz)	Pk power spectral density (dBm/MHz)	Limit (dBm)	Delta (dB)
36	5.180	-2.27	4	-6.27
42	5.210	-1.97	4	-5.97
48	5.240	-1.77	4	-5.77
149	5.745	-2.94	17	-19.94
157	5.785	-2.97	17	-19.97
161	5.805	-3.34	17	-20.34

See following pages

Peak power spectral density
 Channel 36, 54 Mbps, power setting 40

* Agilent 11:09:00 Mar 12, 2009

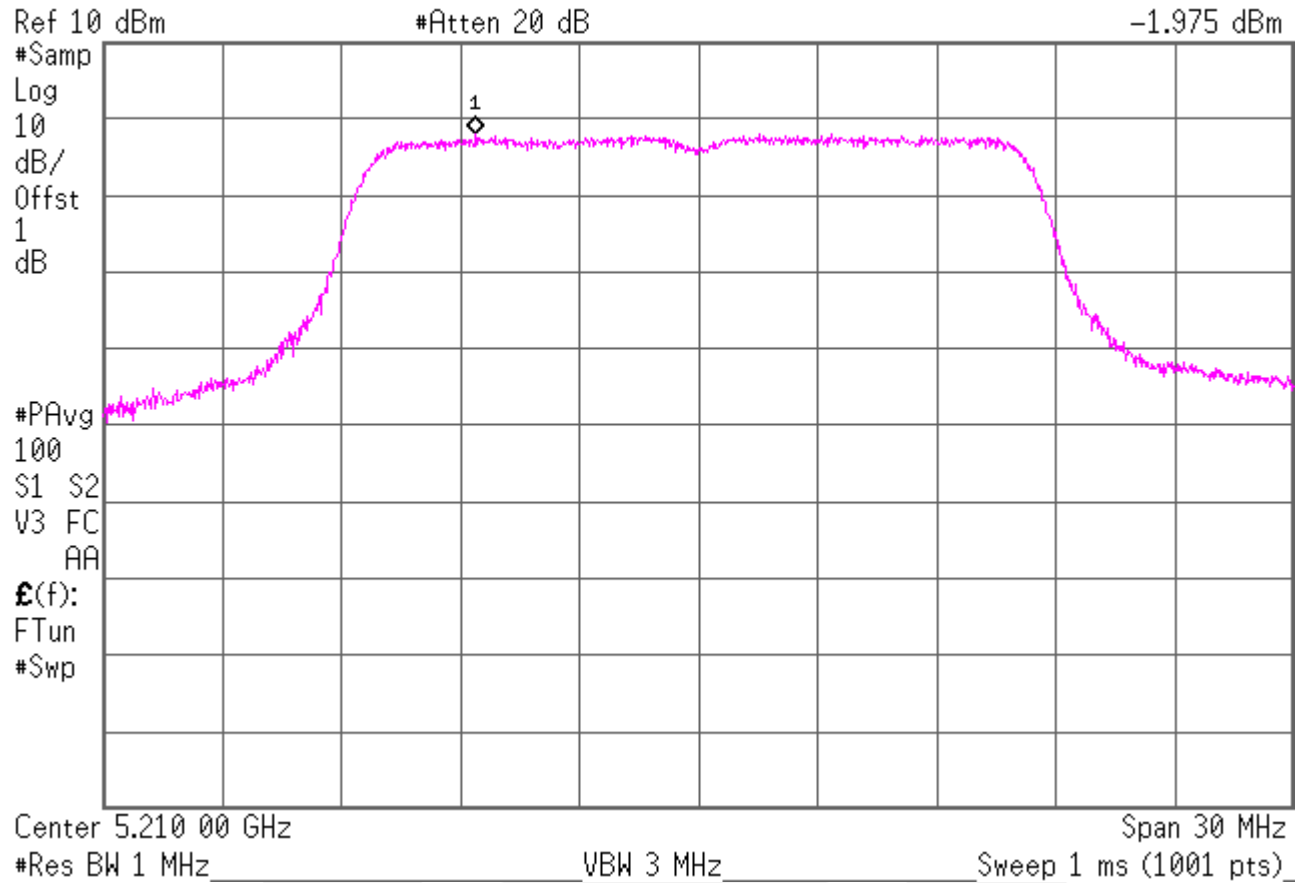
Mkr1 5.184 47 GHz
 -2.272 dBm



Peak power spectral density
 Channel 42, 54 Mbps, power setting 40

* Agilent 11:15:40 Mar 12, 2009

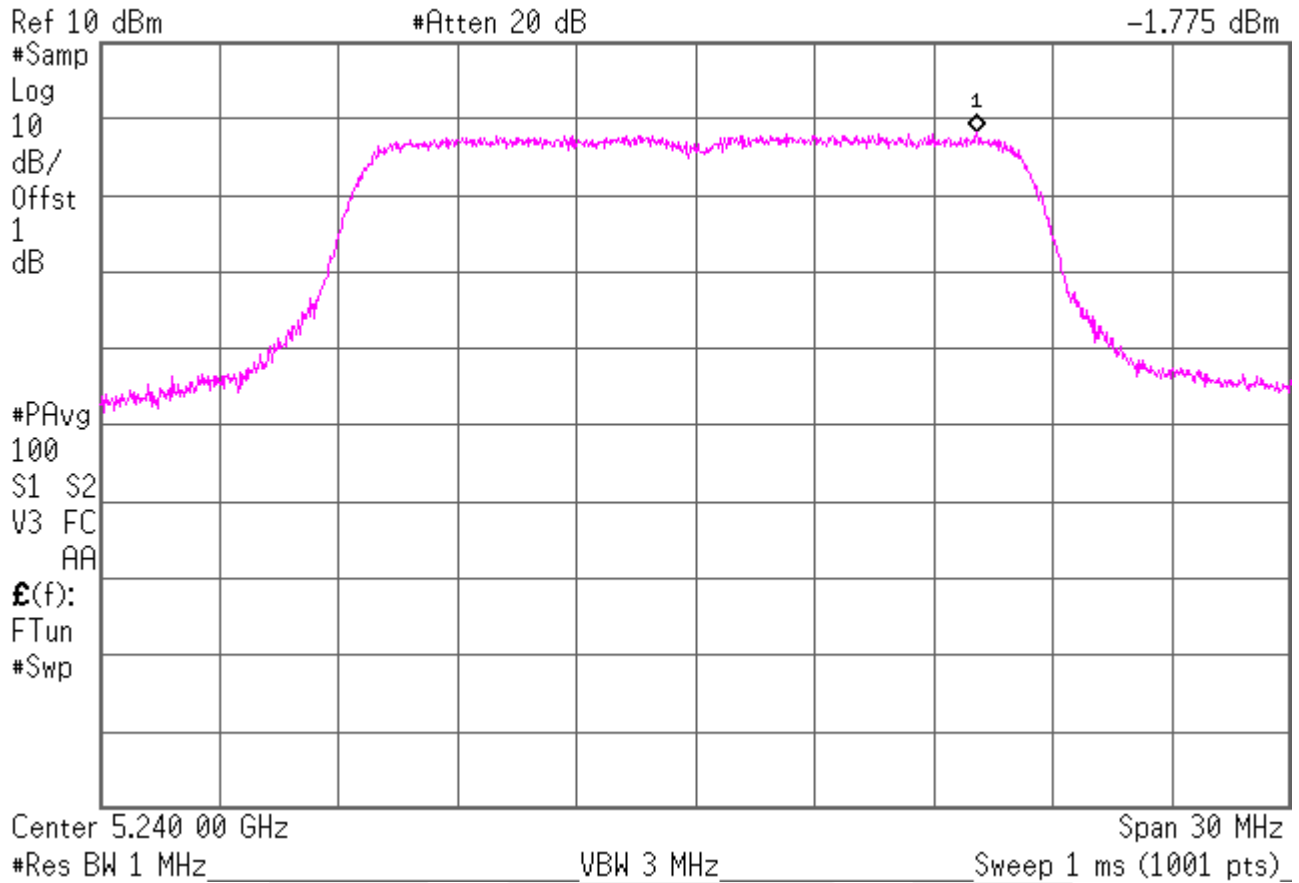
Mkr1 5.204 39 GHz
 -1.975 dBm



Peak power spectral density
Channel 48, 54 Mbps, power setting 40

Agilent 11:16:40 Mar 12, 2009

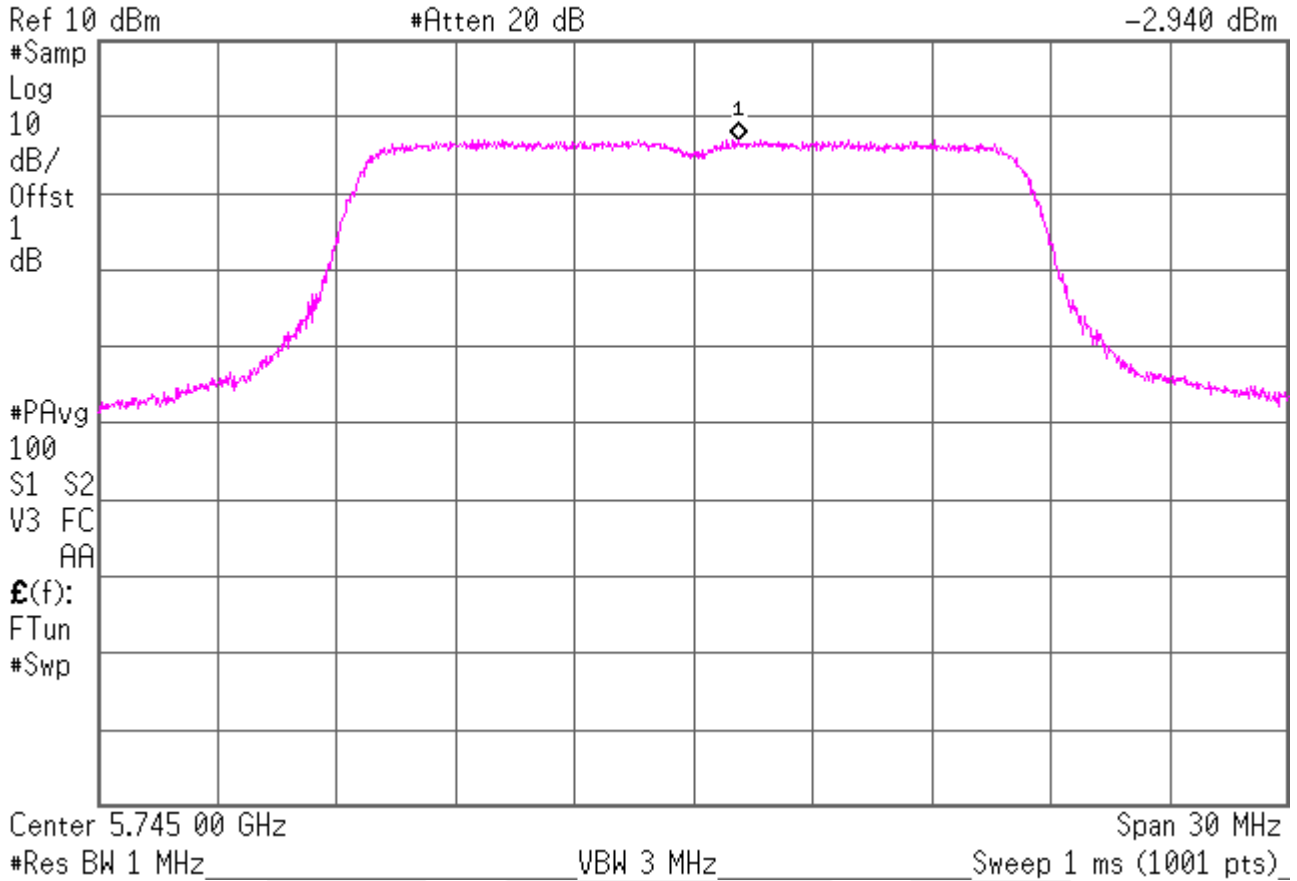
Mkr1 5.247 08 GHz
-1.775 dBm



Peak power spectral density
Channel 149, 54 Mbps, power setting 40

Agilent 11:34:17 Mar 12, 2009

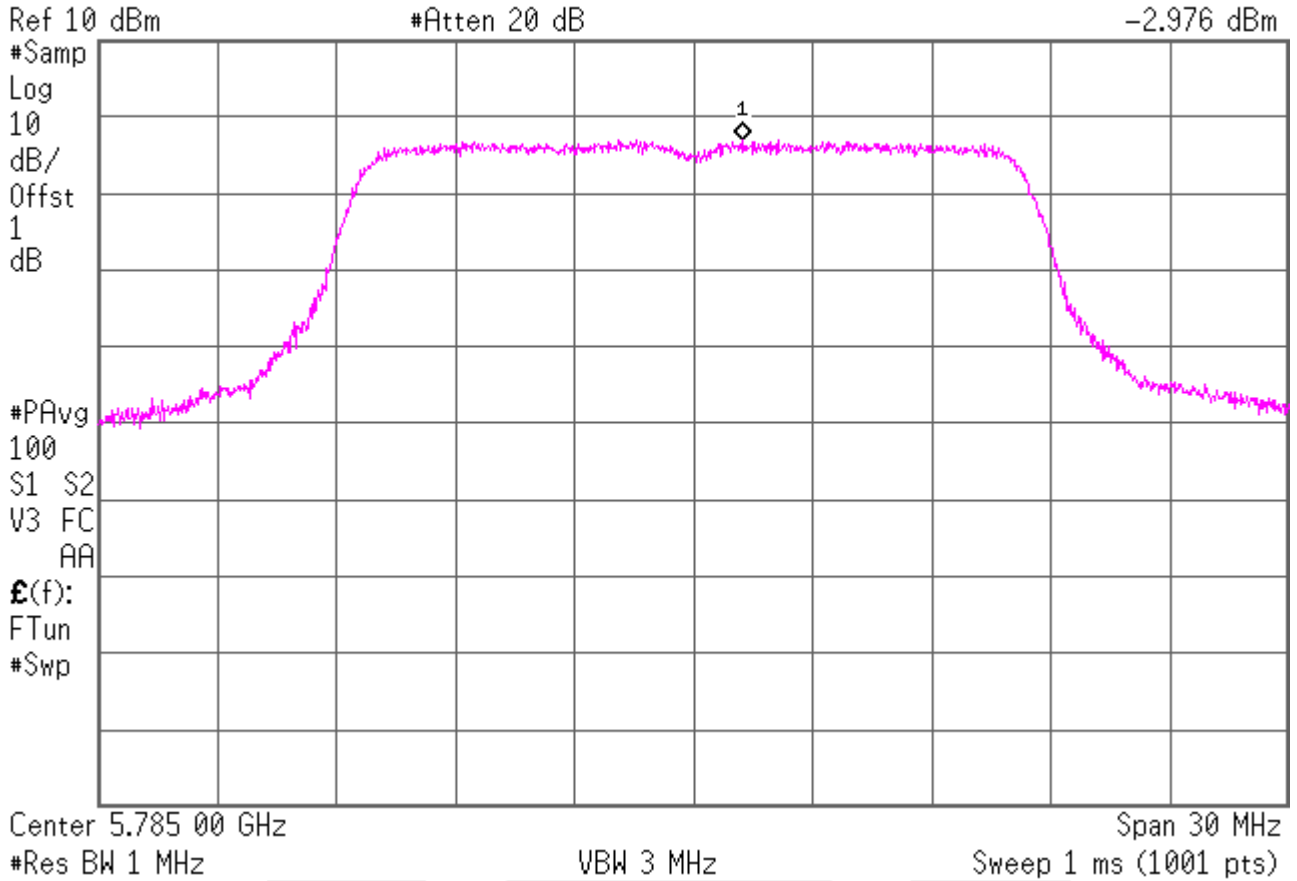
Mkr1 5.746 11 GHz
-2.940 dBm



Peak power spectral density
 Channel 157, 54 Mbps, power setting 40

Agilent 11:35:45 Mar 12, 2009

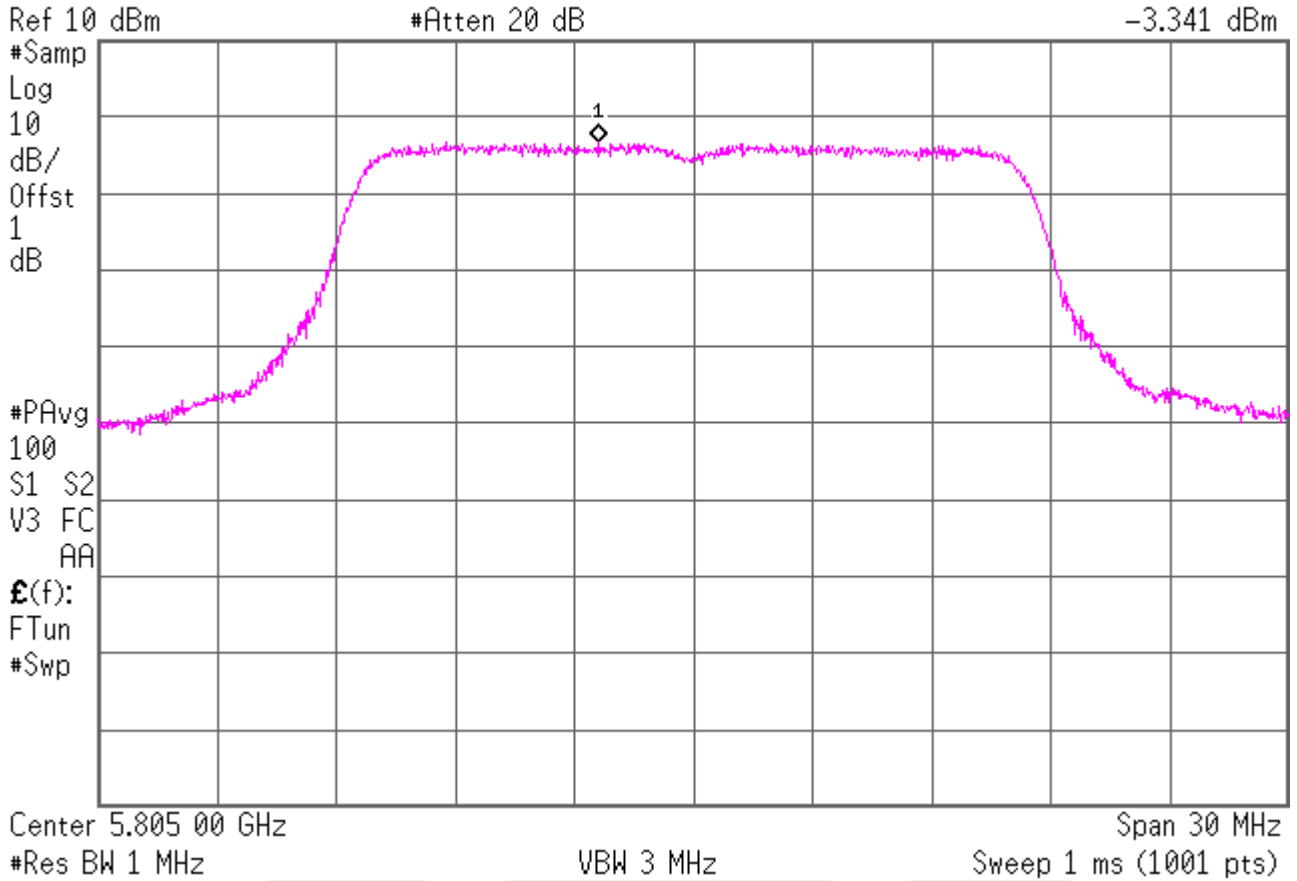
Mkr1 5.786 26 GHz
 -2.976 dBm



Peak power spectral density
 Channel 161, 54 Mbps, power setting 40

Agilent 11:37:12 Mar 12, 2009

Mkr1 5.802 63 GHz
 -3.341 dBm



Peak excursion FCC 15.407(a)

Test summary

The requirements are: - MET - NOT MET

Testing was performed in accordance with the test procedure of FCC Public Notice DA 02-2138

Maximum peak excursion is 12.83 dB, channel 161, 5.805 GHz

Test location

- Wild River Lab Large Test Site (Open Area Test Site)

- Wild River Lab Small Test Site (Open Area Test Site)

- Wild River Lab Tech Area, conducted measurement

Test equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Due
WRLE03371	E4440A	Agilent	Spectrum Analyzer	MY43362222	11-Aug-10

Test limit

Trace 1 & 2 delta \leq 13 dB

Test data

See following pages

Peak excursion
Channel 36, 54 Mbps, power setting 40

* Agilent 13:42:44 Mar 12, 2009

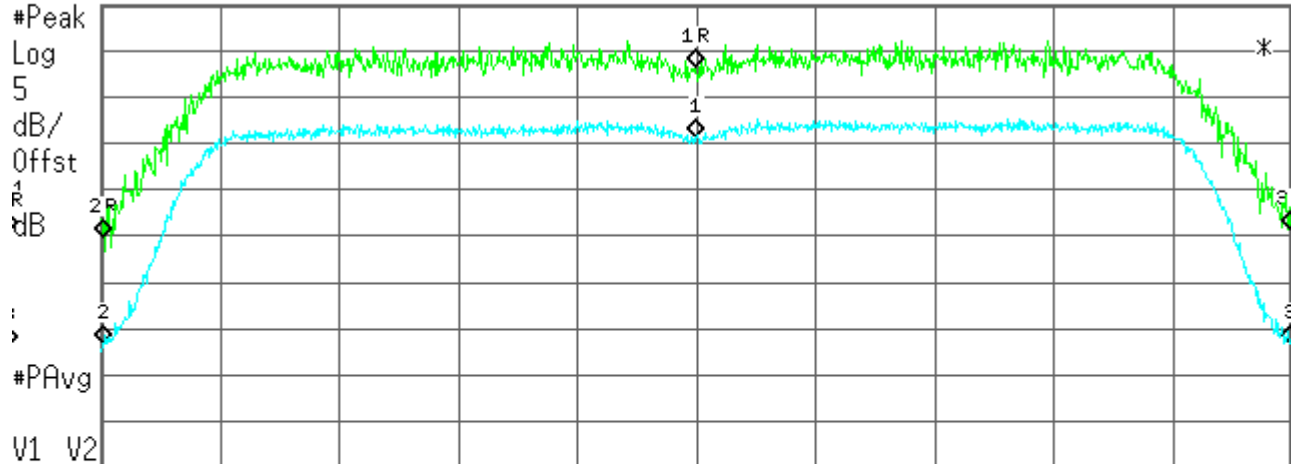
Trace 2 =sample det, pwr avg 100-pwr meth 1

▲ Mkr3 0 Hz

Ref 10 dBm

#Atten 20 dB

-12.36 dB



Center 5.180 00 GHz

Span 19.86 MHz

#Res BW 1 MHz

VBW 3 MHz

Sweep 1 ms (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1R	(2)	Freq	5.180 00 GHz	3.34 dBm
1Δ	(2)	Freq	0 Hz	-7.61 dB
2R	(2)	Freq	5.170 11 GHz	-15.14 dBm
2Δ	(2)	Freq	0 Hz	-11.37 dB
3R	(2)	Freq	5.189 91 GHz	-14.24 dBm
3Δ	(2)	Freq	0 Hz	-12.36 dB

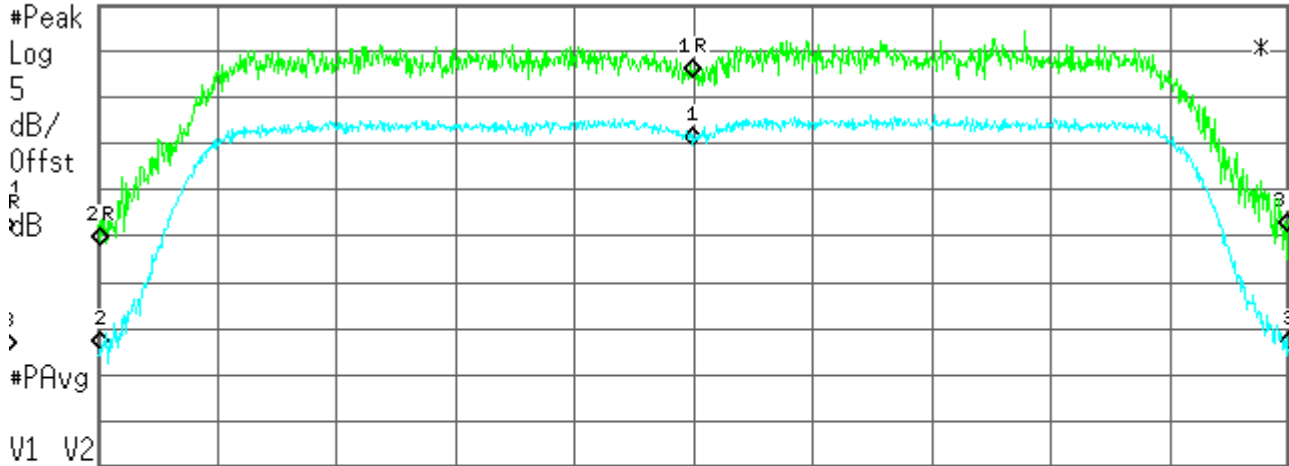
Trace 2 = sample detector, power average 100 traces = power measurement method 1

Peak excursion
Channel 42, 54 Mbps, power setting 40

Agilent 13:51:21 Mar 12, 2009

Trace 2 = sample det, pwr avg 100 - pwr meth 1
Ref 10 dBm #Atten 20 dB

▲ Mkr3 20 kHz
-12.78 dB



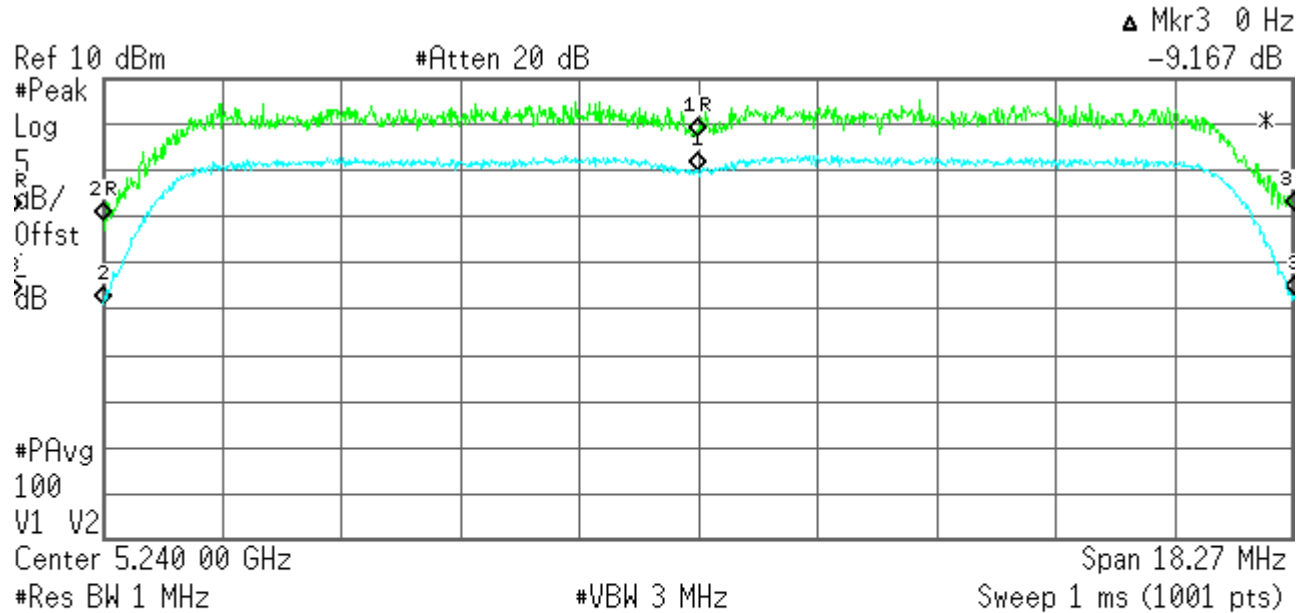
Center 5.210 00 GHz Span 20.13 MHz
#Res BW 1 MHz VBW 3 MHz Sweep 1 ms (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1R	(2)	Freq	5.210 00 GHz	2.13 dBm
1Δ	(2)	Freq	0 Hz	-7.21 dB
2R	(2)	Freq	5.199 98 GHz	-15.93 dBm
2Δ	(2)	Freq	0 Hz	-11.33 dB
3R	(2)	Freq	5.220 04 GHz	-14.50 dBm
3Δ	(2)	Freq	20 kHz	-12.78 dB

Trace 2 = sample detector, power average 100 traces = power measurement method 1

Peak excursion
Channel 48, 54 Mbps, power setting 40

Agilent 14:16:00 Sep 17, 2008

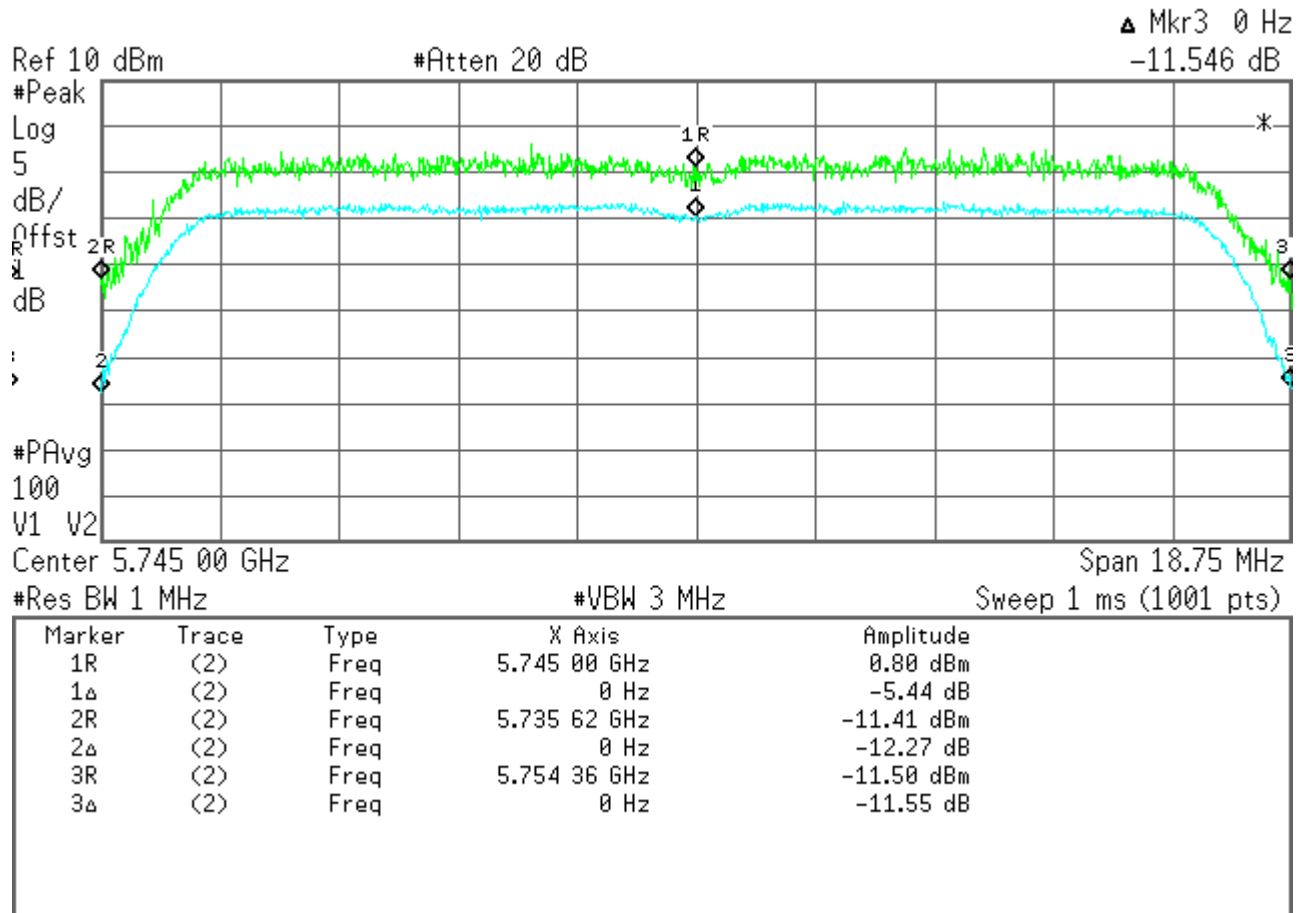


Marker	Trace	Type	X Axis	Amplitude
1R	(2)	Freq	5.240 00 GHz	3.66 dBm
1Δ	(2)	Freq	0 Hz	-3.54 dB
2R	(2)	Freq	5.230 86 GHz	-5.47 dBm
2Δ	(2)	Freq	0 Hz	-8.91 dB
3R	(2)	Freq	5.249 14 GHz	-4.32 dBm
3Δ	(2)	Freq	0 Hz	-9.17 dB

Trace 2 = sample detector, power average 100 traces = power measurement method 1

Peak excursion
Channel 149, 54 Mbps, power setting 40

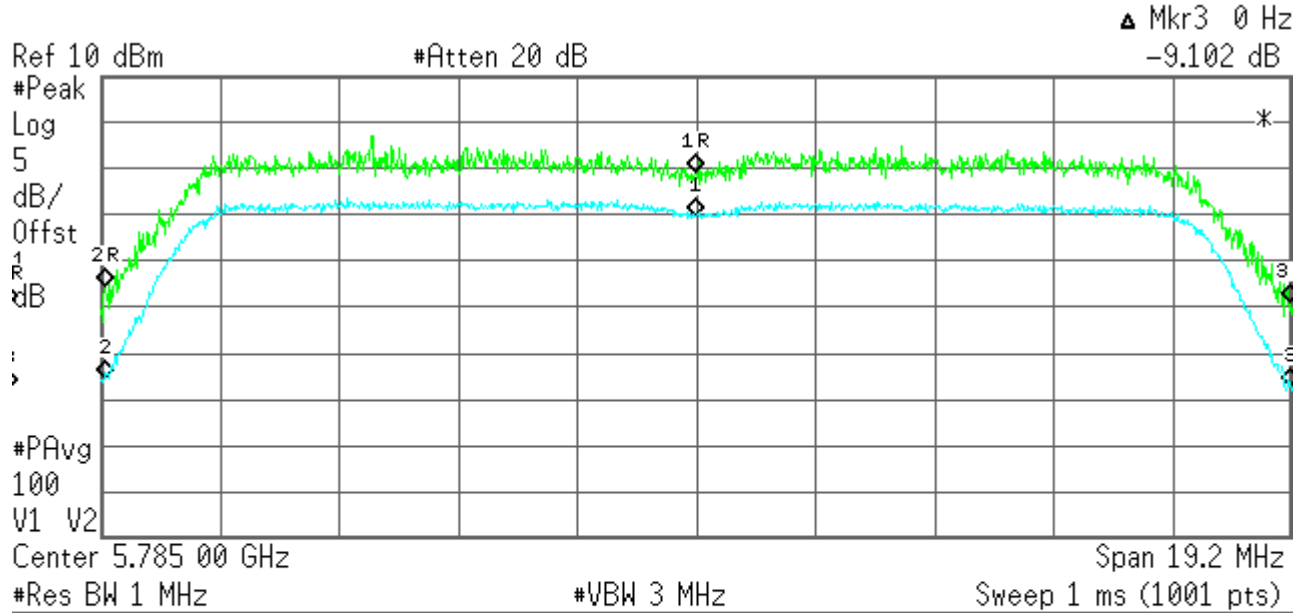
Agilent 15:29:21 Sep 17, 2008



Trace 2 = sample detector, power average 100 traces = power measurement method 1

Peak excursion
Channel 157, 54 Mbps, power setting 40

* Agilent 15:31:39 Sep 17, 2008

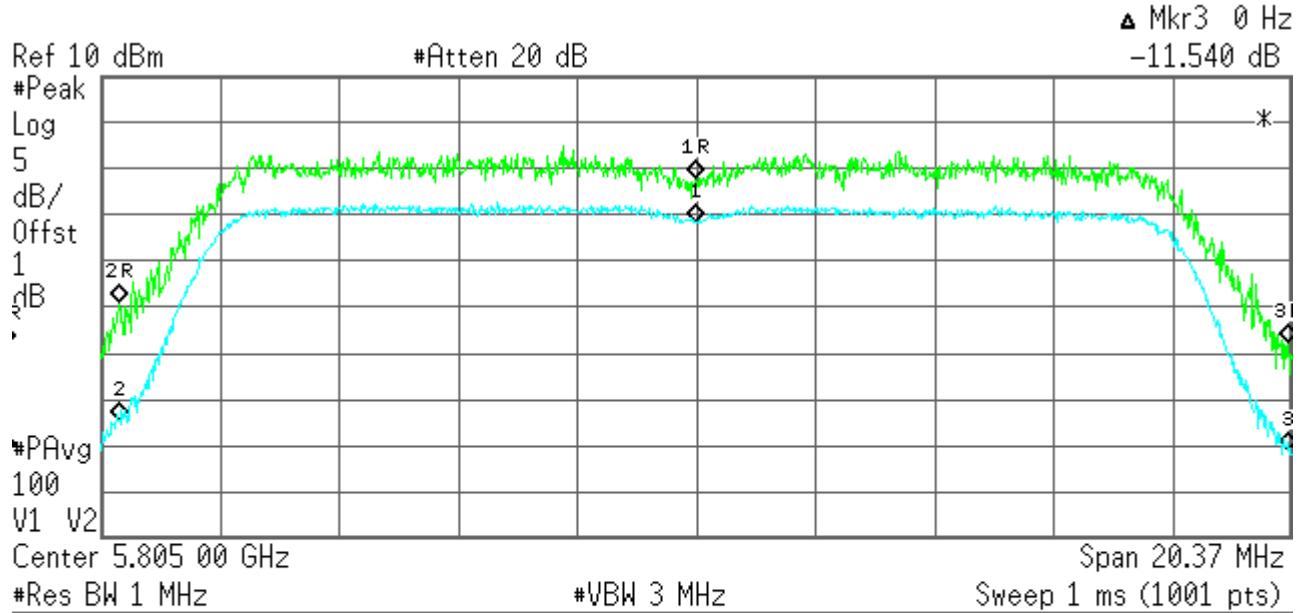


Marker	Trace	Type	X Axis	Amplitude
1R	(2)	Freq	5.785 00 GHz	-8.34 dBm
1Δ	(2)	Freq	0 Hz	-4.75 dB
2R	(2)	Freq	5.775 46 GHz	-12.77 dBm
2Δ	(2)	Freq	0 Hz	-9.95 dB
3R	(2)	Freq	5.794 58 GHz	-14.47 dBm
3Δ	(2)	Freq	0 Hz	-9.10 dB

Trace 2 = sample detector, power average 100 traces = power measurement method 1

Peak excursion
Channel 161, 54 Mbps, power setting 40

* Agilent 15:35:59 Sep 17, 2008



Marker	Trace	Type	X Axis	Amplitude
1R	(2)	Freq	5.805 00 GHz	-1.07 dBm
1Δ	(2)	Freq	0 Hz	-4.65 dB
2R	(2)	Freq	5.795 12 GHz	-14.37 dBm
2Δ	(2)	Freq	0 Hz	-12.83 dB
3R	(2)	Freq	5.815 10 GHz	-18.87 dBm
3Δ	(2)	Freq	0 Hz	-11.54 dB

Trace 2 = sample detector, power average 100 traces = power measurement method 1

Emission bandwidth

FCC 15.407(a)

Test summary

The requirements are: - MET - NOT MET

Testing was performed in accordance with the test procedure of FCC Public Notice DA 02-2138

The emission bandwidth ranges from 18.27 to 20.37 MHz

Test location

- Wild River Lab Large Test Site (Open Area Test Site)

- Wild River Lab Small Test Site (Open Area Test Site)

- Wild River Lab Tech Area, conducted measurement

Test equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Due
WRLE03371	E4440A	Agilent	Spectrum Analyzer	MY43362222	11-Aug-10

Test limit

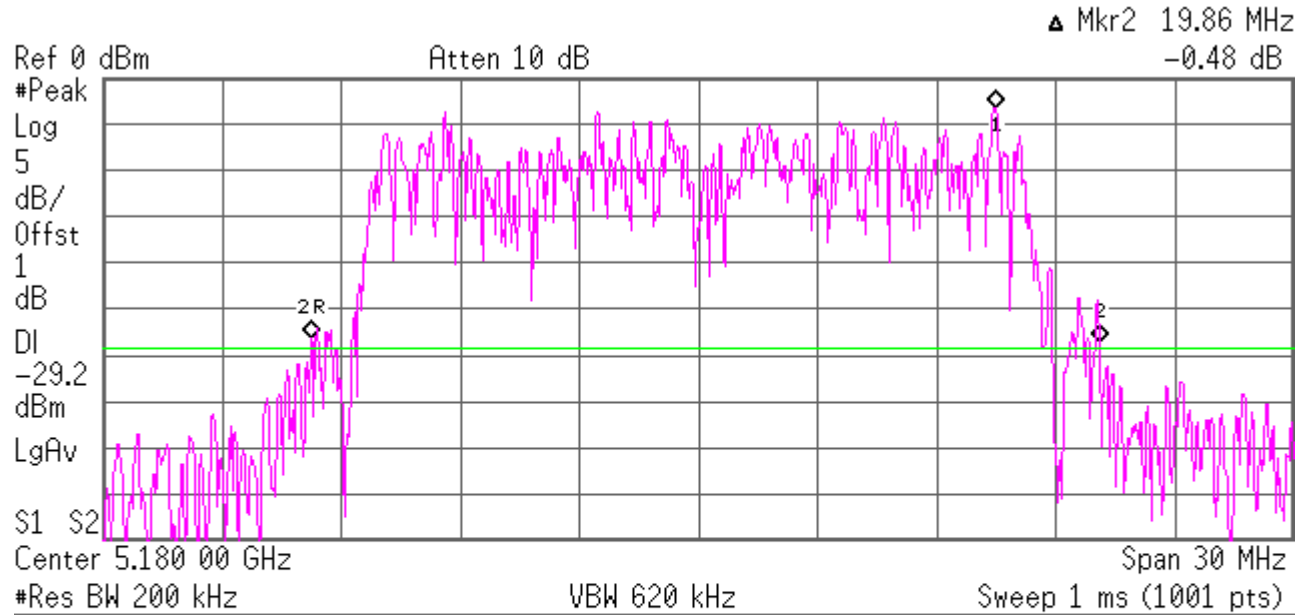
undefined

Test data

See following pages

Emission bandwidth
Channel 36, 54 Mbps, power setting 40

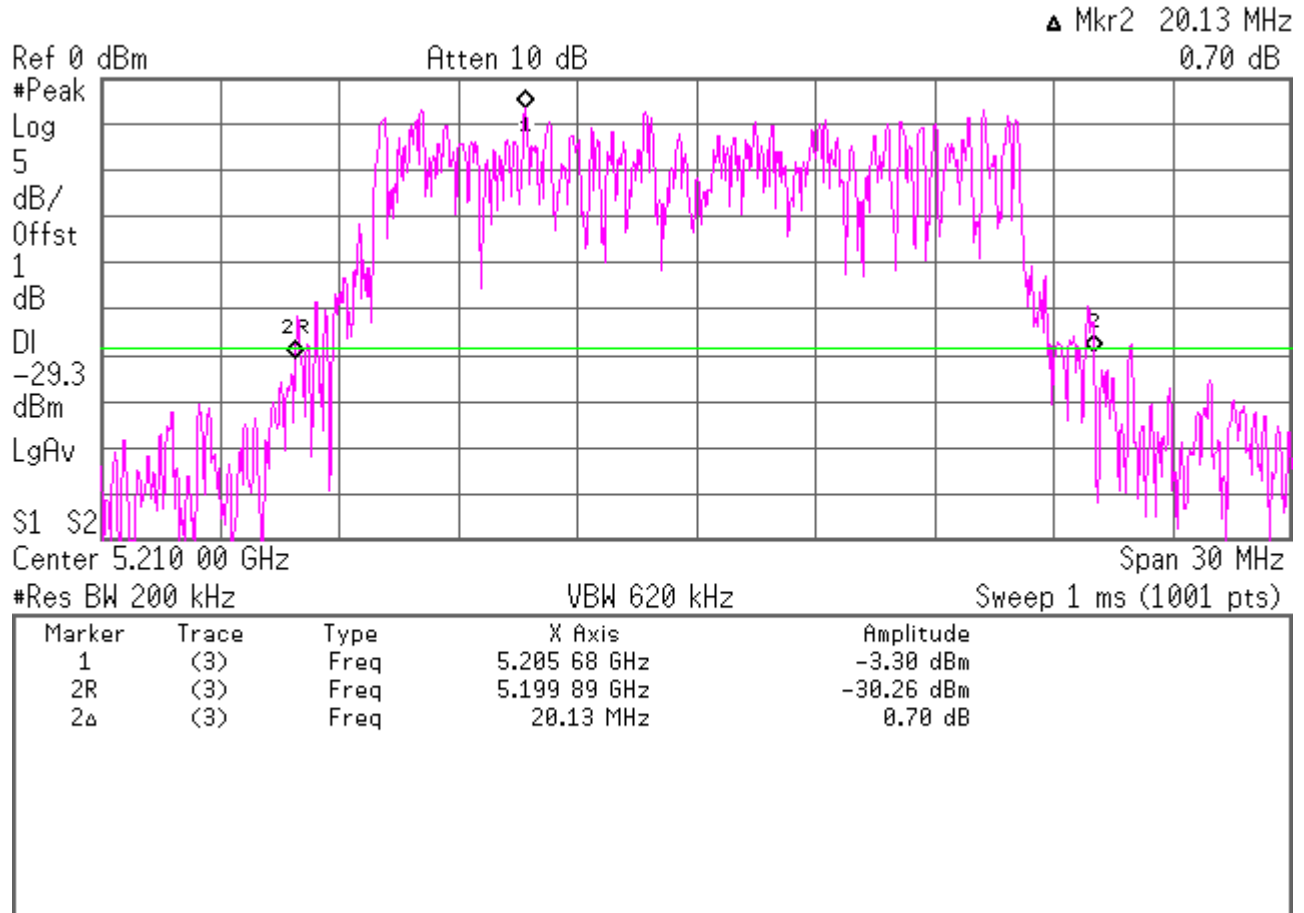
* Agilent 10:00:06 Mar 12, 2009



Marker	Trace	Type	X Axis	Amplitude
1	(3)	Freq	5.187 47 GHz	-3.24 dBm
2R	(3)	Freq	5.170 25 GHz	-28.16 dBm
2Δ	(3)	Freq	19.86 MHz	-0.48 dB

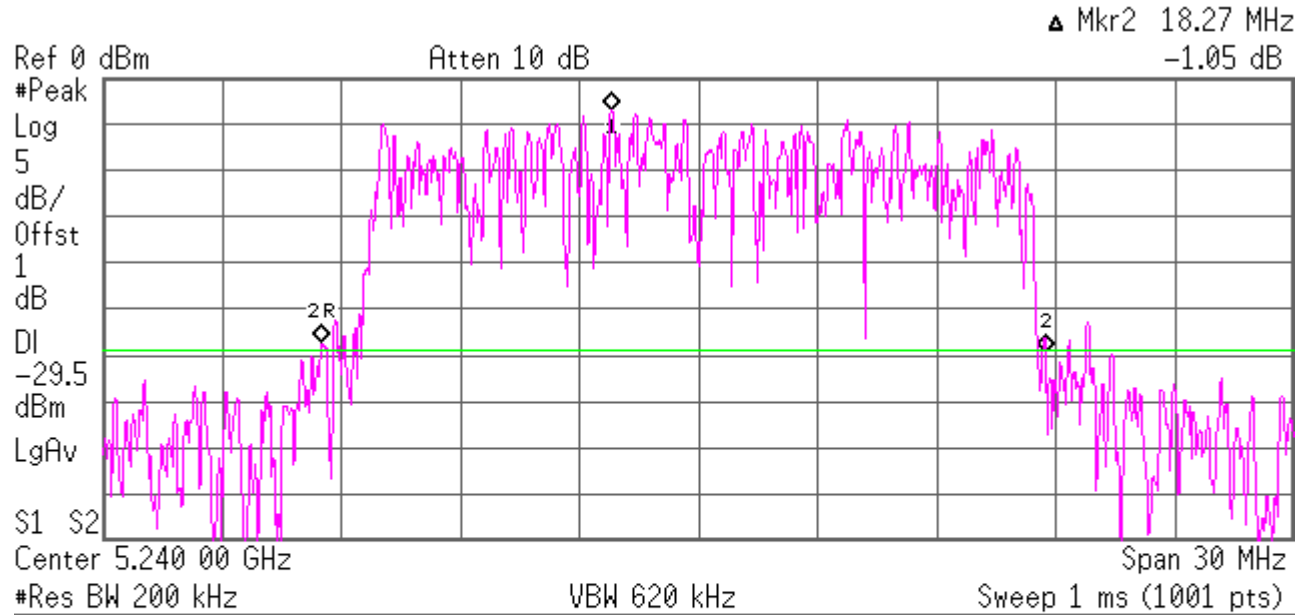
Emission bandwidth
Channel 42, 54 Mbps, power setting 40

* Agilent 10:15:19 Mar 12, 2009



Emission bandwidth
Channel 48, 54 Mbps, power setting 40

* Agilent 10:16:29 Sep 17, 2008

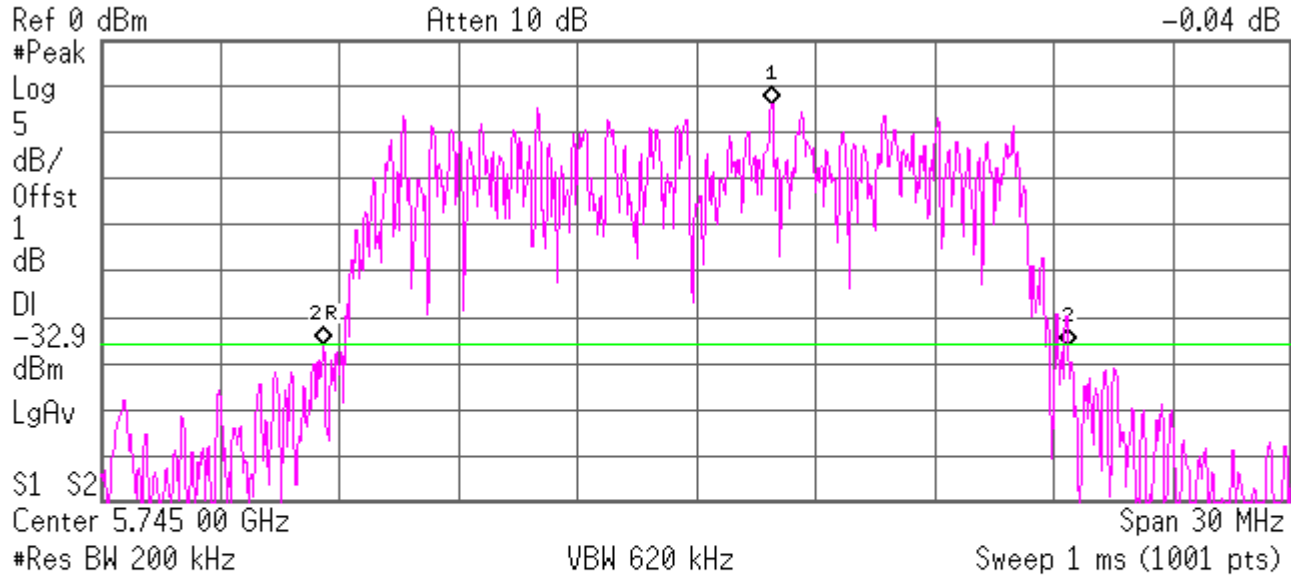


Marker	Trace	Type	X Axis	Amplitude
1	(3)	Freq	5.237 81 GHz	-3.54 dBm
2R	(3)	Freq	5.230 49 GHz	-28.67 dBm
2Δ	(3)	Freq	18.27 MHz	-1.05 dB

Emission bandwidth
Channel 149, 54 Mbps, power setting 40

Agilent 10:22:11 Sep 17, 2008

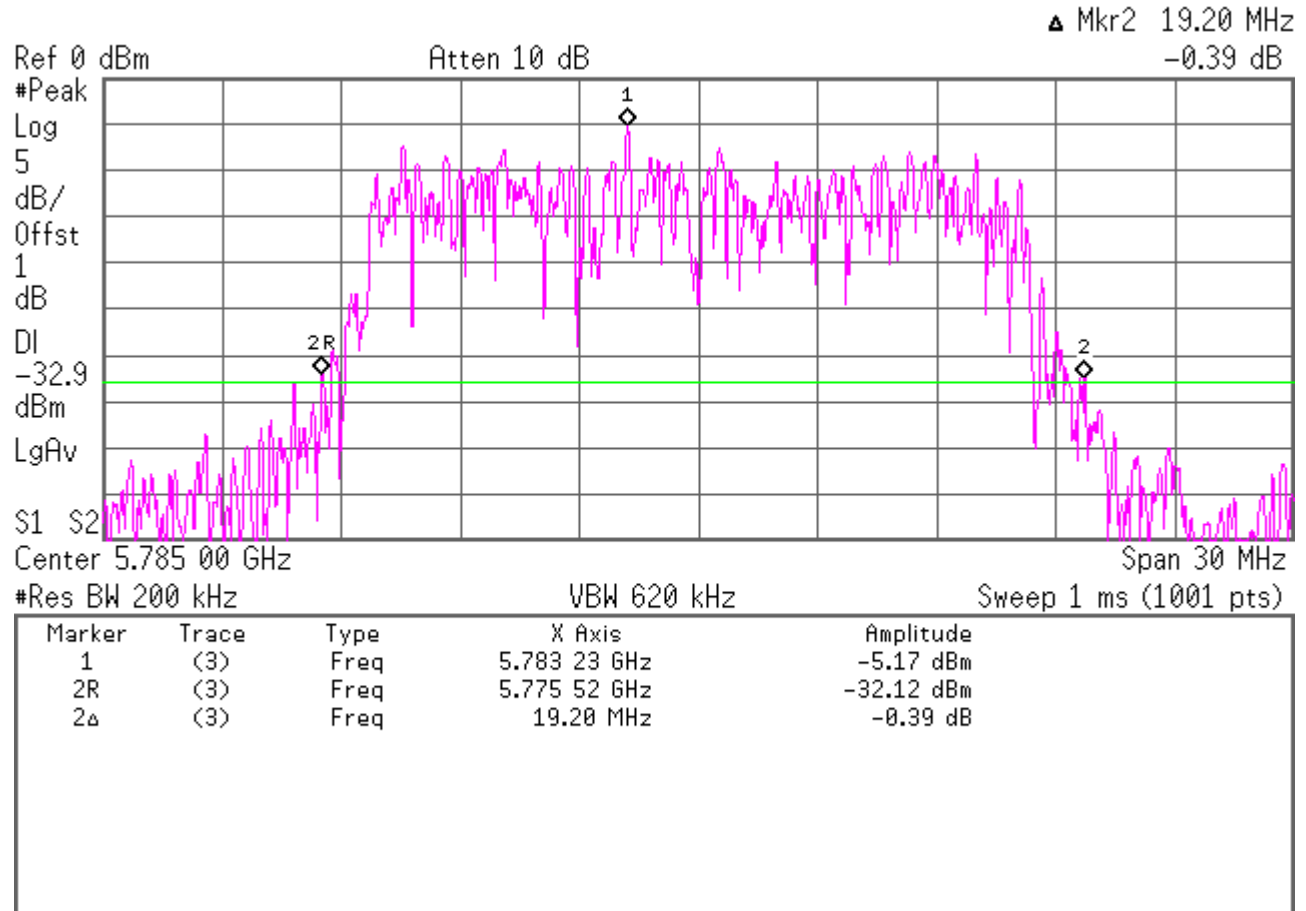
▲ Mkr2 18.75 MHz
-0.04 dB



Marker	Trace	Type	X Axis	Amplitude
1	(3)	Freq	5.746 89 GHz	-6.94 dBm
2R	(3)	Freq	5.735 61 GHz	-32.99 dBm
2▲	(3)	Freq	18.75 MHz	-0.04 dB

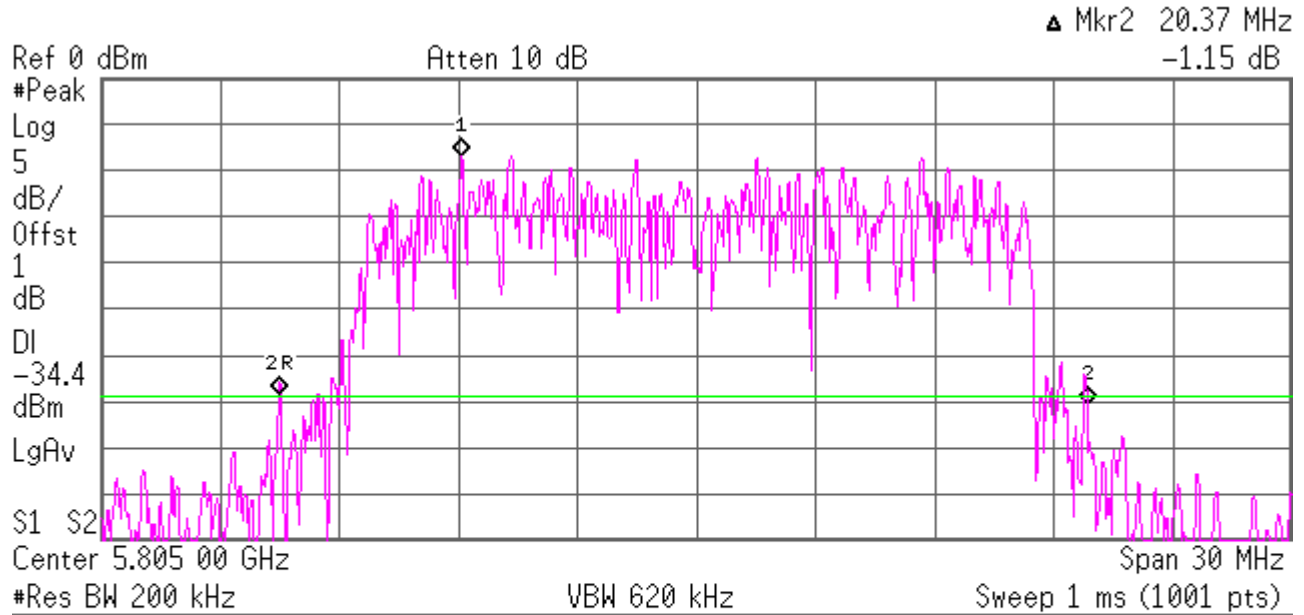
Emission bandwidth
 Channel 157, 54 Mbps, power setting 40

* Agilent 10:23:00 Sep 17, 2008



Emission bandwidth
 Channel 161, 54 Mbps, power setting 40

* Agilent 10:24:31 Sep 17, 2008



Marker	Trace	Type	X Axis	Amplitude
1	(3)	Freq	5.799 09 GHz	-8.43 dBm
2R	(3)	Freq	5.794 47 GHz	-34.17 dBm
2▲	(3)	Freq	20.37 MHz	-1.15 dB

Conducted Limits – AC power lines FCC 15.407(b)(6)

Test summary

The requirements are: - MET - NOT MET

Testing was performed in accordance with the test procedure of ANSI C63.4-2003 7.2.1

The maximum emission is 45.08 dBuV at 300.0 kHz

The minimum margin of compliance is 5.16 dB

Test location

- Wild River Lab Large Test Site (Open Area Test Site)

- Wild River Lab Small Test Site (Open Area Test Site)

- Wild River Lab Shield Room 2

Test equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Due
WRLE02534	ESHS-20	Rhode & Schwarz	EMI Receiver	837055/003	09-Apr-10
WRLE03990	3816/2	ETS Lindgren	50 Ω LISN	00035359	Code B 28-Jul-10

Test limit

Frequency (MHz)	Conducted limit (dBμV)	
	Quasi-peak	Average
0.15 – 0.5	66 to 56*	56 to 46*
0.5 - 5	56	46
5 - 30	60	50

*Decreases with the logarithm of the frequency

Test data

See following pages

CONDUCTED EMISSIONS



Test Report #: WC807706 Run 8 Test Area: SR2
 EUT Model #: 50001558-01 Date: 11/14/2008
 EUT Serial #: 0000x EUT Power: 3.3 VDC Temperature: 23.0 °C
 Test Method: FCC 15.407 Air Pressure: 99.0 kPa
 Customer: Digi International Rel. Humidity: 31.0 %

EUT Description: Connect WiEM 9210 a/b/g, 802.11 a/b/g embedded radio module

Notes: _____

Data File Name: 7706 PCB.dat

Page: 1 of 4

List of measurements for run #: 8

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV)	EUT Lead	DELTA1 FCC B Qp	DELTA2 FCC B Avg
PCB antenna						
160.0 kHz	46.49 Qp	0.01 / 0.05 / 0.0 / 0.0	46.55	N	-18.91	n/a
190.0 kHz	43.51 Qp	0.01 / 0.04 / 0.0 / 0.0	43.57	N	-20.47	n/a
300.0 kHz	31.41 Qp	0.02 / 0.04 / 0.0 / 0.0	31.47	N	-28.77	n/a
320.0 kHz	24.97 Qp	0.02 / 0.04 / 0.0 / 0.0	25.03	N	-34.67	n/a
6.375 MHz	17.17 Qp	0.21 / 0.1 / 0.0 / 0.0	17.48	N	-42.52	n/a
15.96 MHz	27.41 Qp	0.32 / 0.32 / 0.0 / 0.0	28.05	N	-31.95	n/a
Antenna						
160.0 kHz	15.89 Av	0.01 / 0.05 / 0.0 / 0.0	15.95	N	n/a	-39.51
190.0 kHz	19.78 Av	0.01 / 0.04 / 0.0 / 0.0	19.84	N	n/a	-34.2
300.0 kHz	28.9 Av	0.02 / 0.04 / 0.0 / 0.0	28.96	N	n/a	-21.28
320.0 kHz	20.94 Av	0.02 / 0.04 / 0.0 / 0.0	21.0	N	n/a	-28.7
6.375 MHz	11.85 Av	0.21 / 0.1 / 0.0 / 0.0	12.16	N	n/a	-37.84
15.96 MHz	19.48 Av	0.32 / 0.32 / 0.0 / 0.0	20.12	N	n/a	-29.88
Antenna						
160.0 kHz	46.73 Qp	0.01 / 0.05 / 0.0 / 0.0	46.79	L1	-18.67	n/a
190.0 kHz	45.31 Qp	0.01 / 0.04 / 0.0 / 0.0	45.37	L1	-18.67	n/a
300.0 kHz	47.05 Qp	0.02 / 0.04 / 0.0 / 0.0	47.11	L1	-13.13	n/a
320.0 kHz	40.95 Qp	0.02 / 0.04 / 0.0 / 0.0	41.01	L1	-18.69	n/a
6.375 MHz	15.51 Qp	0.21 / 0.1 / 0.0 / 0.0	15.82	L1	-44.18	n/a
15.96 MHz	20.77 Qp	0.32 / 0.32 / 0.0 / 0.0	21.41	L1	-38.59	n/a
Antenna						
160.0 kHz	21.44 Av	0.01 / 0.05 / 0.0 / 0.0	21.5	L1	n/a	-33.96
190.0 kHz	29.96 Av	0.01 / 0.04 / 0.0 / 0.0	30.02	L1	n/a	-24.02
300.0 kHz	45.02 Av	0.02 / 0.04 / 0.0 / 0.0	45.08	L1	n/a	-5.16
320.0 kHz	36.84 Av	0.02 / 0.04 / 0.0 / 0.0	36.9	L1	n/a	-12.8
6.375 MHz	9.92 Av	0.21 / 0.1 / 0.0 / 0.0	10.23	L1	n/a	-39.77
15.96 MHz	15.48 Av	0.32 / 0.32 / 0.0 / 0.0	16.12	L1	n/a	-33.88

Tested by: Greg Jakubowski
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Greg Jakubowski

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Reviewed by: Joel T Schneider
Printed

Joel T. Schneider

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CONDUCTED EMISSIONS



Test Report #: WC807706 Run 8 Test Area: SR2
 EUT Model #: 50001558-01 Date: 11/14/2008
 EUT Serial #: 0000x EUT Power: 3.3 VDC Temperature: 23.0 °C
 Test Method: FCC 15.407 Air Pressure: 99.0 kPa
 Customer: Digi International Rel. Humidity: 31.0 %

EUT Description: Connect WiEM 9210 a/b/g, 802.11 a/b/g embedded radio module

Notes: _____

Data File Name: 7706 PCB.dat Page: 2 of 4

Measurement summary for limit1: FCC B Qp (Qp)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV)	EUT Lead	DELTA1 FCC B Qp
300.0 kHz	47.05 Qp	0.02 / 0.04 / 0.0 / 0.0	47.11	L1	-13.13
160.0 kHz	46.73 Qp	0.01 / 0.05 / 0.0 / 0.0	46.79	L1	-18.67
190.0 kHz	45.31 Qp	0.01 / 0.04 / 0.0 / 0.0	45.37	L1	-18.67
320.0 kHz	40.95 Qp	0.02 / 0.04 / 0.0 / 0.0	41.01	L1	-18.69
15.96 MHz	27.41 Qp	0.32 / 0.32 / 0.0 / 0.0	28.05	N	-31.95
6.375 MHz	17.17 Qp	0.21 / 0.1 / 0.0 / 0.0	17.48	N	-42.52

Tested by: Greg Jakubowski
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Reviewed by: Joel T Schneider
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CONDUCTED EMISSIONS



Test Report #: WC807706 Run 8 Test Area: SR2
 EUT Model #: 50001558-01 Date: 11/14/2008
 EUT Serial #: 0000x EUT Power: 3.3 VDC Temperature: 23.0 °C
 Test Method: FCC 15.407 Air Pressure: 99.0 kPa
 Customer: Digi International Rel. Humidity: 31.0 %

EUT Description: Connect WiEM 9210 a/b/g, 802.11 a/b/g embedded radio module

Notes: _____

Data File Name: 7706 PCB.dat Page: 3 of 4

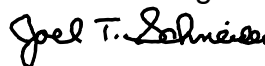
Measurement summary for limit2: FCC B Avg (Av)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV)	EUT Lead	DELTA2 FCC B Avg
300.0 kHz	45.02 Av	0.02 / 0.04 / 0.0 / 0.0	45.08	L1	-5.16
320.0 kHz	36.84 Av	0.02 / 0.04 / 0.0 / 0.0	36.9	L1	-12.8
190.0 kHz	29.96 Av	0.01 / 0.04 / 0.0 / 0.0	30.02	L1	-24.02
15.96 MHz	19.48 Av	0.32 / 0.32 / 0.0 / 0.0	20.12	N	-29.88
160.0 kHz	21.44 Av	0.01 / 0.05 / 0.0 / 0.0	21.5	L1	-33.96
6.375 MHz	11.85 Av	0.21 / 0.1 / 0.0 / 0.0	12.16	N	-37.84

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CONDUCTED EMISSIONS



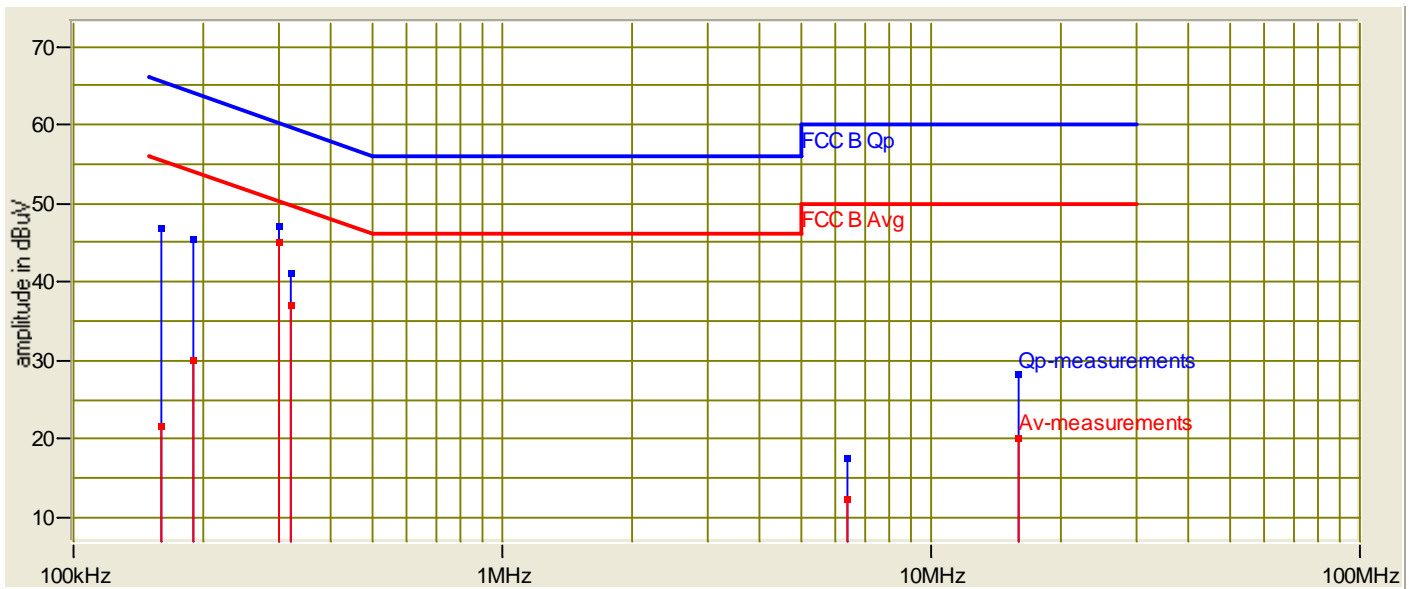
Test Report #: WC807706 Run 8 Test Area: SR2
 EUT Model #: 50001558-01 Date: 11/14/2008
 EUT Serial #: 0000x EUT Power: 3.3 VDC Temperature: 23.0 °C
 Test Method: FCC 15.407 Air Pressure: 99.0 kPa
 Customer: Digi International Rel. Humidity: 31.0 %

EUT Description: Connect WiEM 9210 a/b/g, 802.11 a/b/g embedded radio module

Notes: _____

Data File Name: 7706 PCB.dat Page: 4 of 4

Graph:



Tested by: Greg Jakubowski *Greg Jakubowski*
 Printed Signature
 Reviewed by: Joel T Schneider *Joel T. Schneider*
 Printed Signature

99% Emission bandwidth IC RSS-Gen 4.6.1

Test summary

The requirements are: - MET - NOT MET

Test was performed in accordance with the article "The Measurement of Occupied Bandwidth" by Industry Canada's certification bureau

The 99% emission bandwidth is 16.35 MHz

Test location

- Wild River Lab Large Test Site (Open Area Test Site)

- Wild River Lab Small Test Site (Open Area Test Site)

- Wild River Lab Tech Area, conducted measurement

Test equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Due
WRLE03371	E4440A	Agilent	Spectrum Analyzer	MY43362222	11-Aug-10

Test limit

undefined

Test data

See following page

99% emission bandwidth
channel 34

Agilent 14:25:18 Sep 18, 2008

Ref lvl = pk msrmt at max rbw

Mkr1 16.35 MHz

Ref 13 dBm

Atten 30 dB

0.76 dB

#Samp

Log

10

dB/

Offst

1

dB

DI

-7.2

dBm

#PAvg

S1 S2

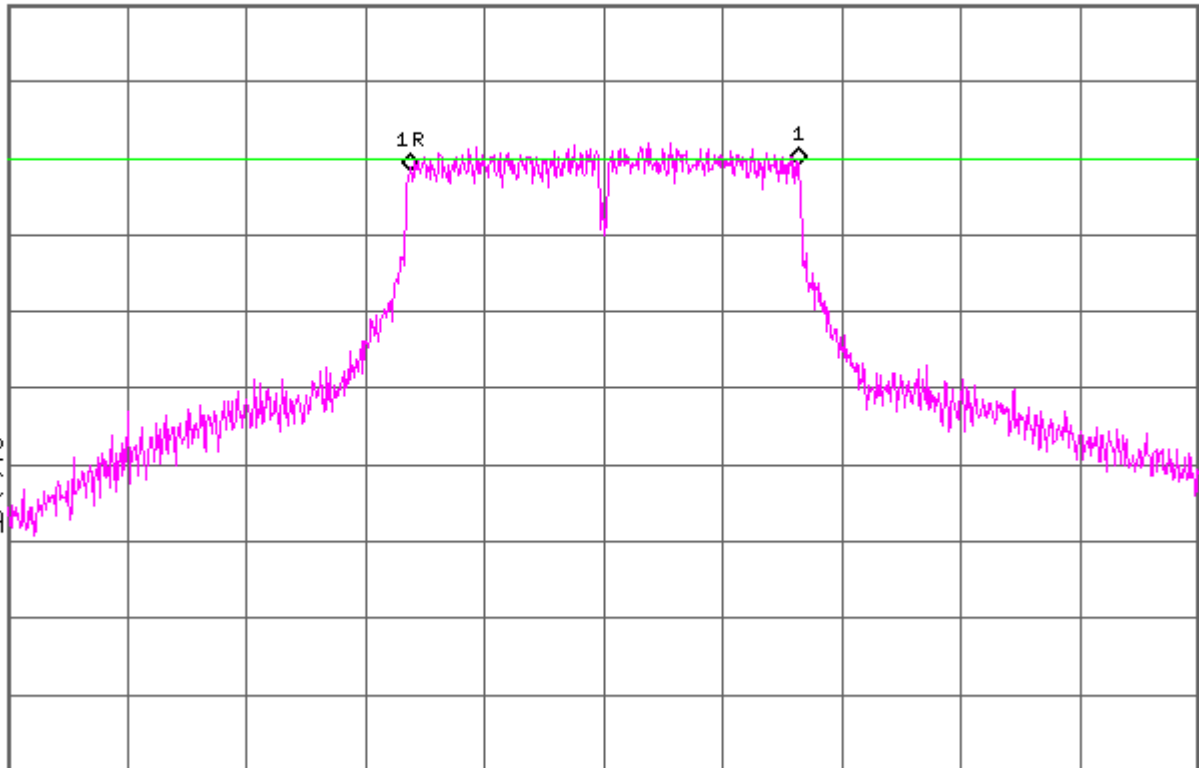
V3 FC

AA

$\mathcal{E}(f)$:

FTun

#Swp



Center 5.170 00 GHz

Span 50 MHz

#Res BW 100 kHz

VBW 300 kHz

Sweep 15.13 ms (1001 pts)

99% emission bandwidth
channel 157

Agilent 14:33:21 Sep 18, 2008

Ref lvl = pk msrmt at max rbw

Mkr1 16.35 MHz

Ref 9 dBm

Atten 20 dB

-0.26 dB

#Samp

Log

10

dB/

Offst

1

dB

DI

-11.0

dBm

#PAvg

S1 S2

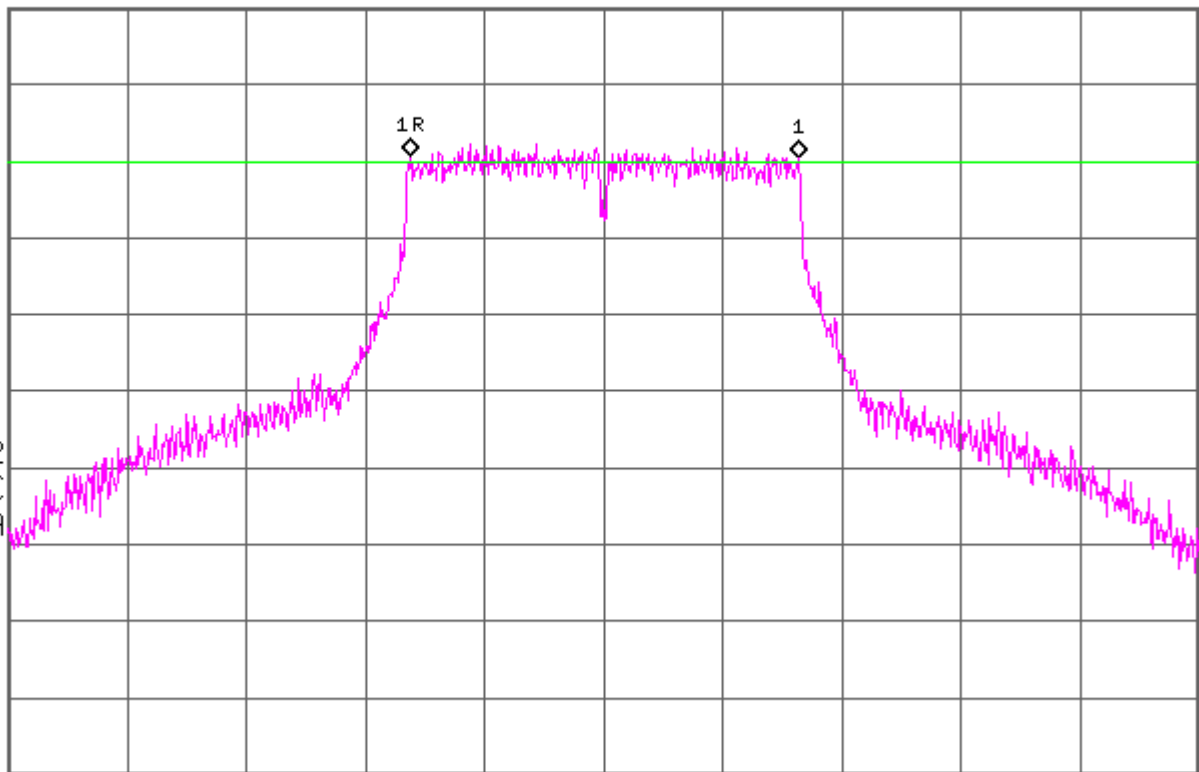
V3 FC

AA

$E(f)$:

FTun

#Swp



Center 5.785 00 GHz

Span 50 MHz

#Res BW 100 kHz

VBW 300 kHz

Sweep 15.13 ms (1001 pts)

Undesirable emissions

FCC 15.407(b), IC RSS-210 A9.3

Test summary

The requirements are: - MET - NOT MET

Testing was performed in accordance with the test procedure of ANSI C63.4 8.3

Maximum undesirable emission is 11.4 GHz, 68.03 dBuV/m at 3 meter or -27.2 dBm eirp

Minimum margin of compliance is 0.17 dB

Manufacturer's Tx on time data shows 5.72% duty cycle. Using 10% as worst case scenario

Because radiated emissions measurements above 1 GHz are made using 1 MHz RBW, the -27 dBm/MHz eirp limit was converted to 68.2 dBuV/m at 3 meters with the following generic eirp to field strength conversion formula, solving for field strength.

$$\text{EIRP} = (\text{FS} \times \text{D})^2 / 30$$

where:

EIRP = equivalent isotropically radiated power in watts = -27dBm/MHz eirp limit = 2 uW

FS = field strength in volts/meter

D = measurement distance = 3 meters

therefore:

$$2\mu\text{W} = (\text{FS} \times 3)^2 / 30$$

$$\text{sqrt}(2\mu\text{W} \times 30) / 3 = \text{FS}$$

$$\text{FS} = 0.002582 \text{ V/m} = 68.2 \text{ dBuV/m}$$

Test location

- Wild River Lab Large Test Site (Open Area Test Site)

- Wild River Lab Small Test Site (Open Area Test Site)

- Wild River Lab Tech Area, conducted measurement

Test equipment

TUV ID	Model	Manufacturer	Description	Serial	Cal Due
WRLE03995	EM-6917B	Electro-Metrics	Biconicalog Periodic	151	24-Apr-10
WRLE02670	8447D	Hewlett-Packard	Preamplifier	2443A03954	Code B 23-Jan-10
WRLE02681	85650A	Hewlett-Packard	Quasi-Peak Adapter	2430A00562	23-Apr-10
WRLE08052	8566B	Hewlett-Packard	Spectrum Analyzer	2115A00853	23-Apr-10
WRLE08051	85662A	Hewlett-Packard	Analyzer Display	2112A02220	23-Apr-10
OWLE03996	SAS-572	A.H. Systems	STD Gain Horn	183	Code Y
WRLE03978	SL26-3010	Phase One Microwave	Amplifier 18-26.5 GHz	0005	14-May-10
WRLE10435	E4440A	Agilent	Spectrum Analyzer	MY44304483	28-Jul-10
WRLE02075	3115	EMCO	Ridge Guide Ant. 1-18 GHz	9001-3275	13-Jan-10
WRLE10536	SL18B4020	Phase One Microwave	Preamplifier 1 – 18 GHz	0002	Code B
WRLE03847	ZHL-1042J	Mini-Circuits	Preamplifier 10 - 3000 MHz	0607	Code B 14-May-10
WRLE02003	F550B1	Acronetics	4 – 8 GHz Bandpass Filter	010	Code B 02-Nov-10
WRLE03933	F551B-1	Acronetics	8 – 12 GHz Bandpass Filter	010	Code B 02-Nov-10
WRLE03934	F549B-1	Acronetics	2 – 4 GHz Bandpass Filter	010	Code B 30-Sep-10
WRLE03935	F548B-1	Acronetics	1 – 2 GHz Bandpass Filter	010	Code B 10-Sep-09
WRLE02661	11970A	Hewlett-Packard	Harm Mixer – 26.5-40 GHz	2332A01861	04-Sep-09
WRLE06717	3116	EMCO	Ridge Guide Ant 18-40 GHz	2005	03-Apr-10

Test limit, FCC 15.407(b)(1-4)

Outside the band of operation, -27 dBm/MHz eirp

Test limit, FCC 15.407(b)(6-8)

Radiated average field strength, 3 meter distance

Frequency (MHz)	dB μ V/m
30 – 88	40
88 – 216	43.5
216 – 960	46
960 – 1000	54
above 1000*	54

*within the restricted bands of 15.205

Test data

See following pages



RADIATED EMISSIONS



America

Test Report #: WC807706 Run 5 Test Area: LTS
 EUT Model #: 50001558-01 Date: 9/23/2008, 10/7/2008
 EUT Serial #: 0000x EUT Power: 3.3 VDC Temperature: 24.0 °C
 Test Method: FCC 15.407, 15.209 Air Pressure: 99.0 kPa
 Customer: Digi Rel. Humidity: 62.0 %


EUT Description: Connect Wi-EM (Embedded radio module)

Notes: _____

Data File Name: 7706.dat Page: 1 of 5

List of measurements for run #: 5

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.209 <1GHz 3m	DELTA2
Start of Spurious Emissions Scan 30 - 1000MHz.						
5dBi Antenna						
Channel 48 pwr40 54MB						
33.96 MHz	40.4 Qp	0.69 / 19.08 / 30.0 / 0.0	30.17	V / 1.00 / 0	-9.83	n/a
75.626 MHz	41.9 Qp	0.98 / 8.3 / 29.7 / 0.0	21.48	V / 1.00 / 0	-18.52	n/a
108.795 MHz	40.85 Qp	1.15 / 9.18 / 29.7 / 0.0	21.48	V / 1.00 / 0	-22.02	n/a
160.06 MHz	35.2 Qp	1.5 / 8.97 / 29.8 / 0.0	15.87	V / 1.00 / 0	-27.63	n/a
168.659 MHz	37.55 Qp	1.52 / 9.01 / 29.8 / 0.0	18.28	V / 1.00 / 0	-25.22	n/a
192.102 MHz	36.1 Qp	1.59 / 10.76 / 29.8 / 0.0	18.64	V / 1.00 / 0	-24.86	n/a
200.01 MHz	34.6 Qp	1.61 / 10.6 / 29.8 / 0.0	17.01	V / 1.00 / 0	-26.49	n/a
220.01 MHz	32.45 Qp	1.68 / 11.03 / 29.8 / 0.0	15.35	V / 1.00 / 0	-30.65	n/a
240.005 MHz	33.35 Qp	1.78 / 11.73 / 29.7 / 0.0	17.16	V / 1.00 / 0	-28.84	n/a
253.804 MHz	31.1 Qp	1.83 / 12.21 / 29.78 / 0.0	15.36	V / 1.00 / 0	-30.64	n/a
320.027 MHz	40.4 Qp	2.1 / 13.78 / 29.91 / 0.0	26.37	V / 1.00 / 0	-19.63	n/a
340.008 MHz	46.85 Qp	2.14 / 14.39 / 30.0 / 0.0	33.39	V / 1.00 / 0	-12.61	n/a
360.021 MHz	45.85 Qp	2.18 / 14.8 / 30.0 / 0.0	32.84	V / 1.00 / 0	-13.16	n/a
379.996 MHz	43.8 Qp	2.25 / 15.37 / 30.0 / 0.0	31.41	V / 1.00 / 0	-14.59	n/a
383.406 MHz	34.4 Qp	2.26 / 15.34 / 30.0 / 0.0	22.0	V / 1.00 / 0	-24.0	n/a
400.017 MHz	35.75 Qp	2.32 / 15.8 / 30.0 / 0.0	23.87	V / 1.00 / 0	-22.13	n/a
420.003 MHz	34.65 Qp	2.39 / 16.13 / 30.0 / 0.0	23.18	V / 1.00 / 0	-22.82	n/a
449.759 MHz	34.1 Qp	2.49 / 16.49 / 30.01 / 0.0	23.07	V / 1.00 / 0	-22.93	n/a
480.012 MHz	36.45 Qp	2.58 / 16.8 / 30.2 / 0.0	25.63	V / 1.00 / 0	-20.37	n/a
560.013 MHz	32.25 Qp	2.75 / 18.1 / 30.18 / 0.0	22.92	V / 1.00 / 0	-23.08	n/a
562.172 MHz	33.55 Qp	2.75 / 18.15 / 30.17 / 0.0	24.28	V / 1.00 / 0	-21.72	n/a
674.637 MHz	32.05 Qp	3.05 / 19.79 / 30.2 / 0.0	24.69	V / 1.00 / 0	-21.31	n/a
400.017 MHz	38.3 Qp	2.32 / 15.8 / 30.0 / 0.0	26.42	V / 1.00 / 90	-19.58	n/a

Tested by: Greg S Jakubowski 
 Printed Signature

Reviewed by: Joel T Schneider 
 Printed Signature

RADIATED EMISSIONS



America

Test Report #: WC807706 Run 5 Test Area: LTS
 EUT Model #: 50001558-01 Date: 9/23/2008, 10/7/2008
 EUT Serial #: 0000x EUT Power: 3.3 VDC Temperature: 24.0 °C
 Test Method: FCC 15.407, 15.209 Air Pressure: 99.0 kPa
 Customer: Digi Rel. Humidity: 62.0 %

EUT Description: Connect Wi-EM (Embedded radio module)

Notes: _____

Data File Name: 7706.dat Page: 2 of 5

List of measurements for run #: 5

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.209 <1GHz 3m	DELTA2
449.759 MHz	38.15 Qp	2.49 / 16.49 / 30.01 / 0.0	27.12	V / 1.00 / 90	-18.88	n/a
420.003 MHz	36.25 Qp	2.39 / 16.13 / 30.0 / 0.0	24.78	V / 1.00 / 180	-21.22	n/a
200.01 MHz	36.75 Qp	1.61 / 10.6 / 29.8 / 0.0	19.16	V / 1.00 / 180	-24.34	n/a
137.743 MHz	39.35 Qp	1.34 / 8.57 / 29.7 / 0.0	19.56	V / 1.00 / 180	-23.94	n/a
253.804 MHz	31.25 Qp	1.83 / 12.21 / 29.78 / 0.0	15.51	V / 1.00 / 270	-30.49	n/a
562.172 MHz	34.0 Qp	2.75 / 18.15 / 30.17 / 0.0	24.73	V / 1.00 / 270	-21.27	n/a
Start of Maximizing.						
340.008 MHz	50.04 Qp	2.14 / 14.39 / 30.0 / 0.0	36.58	V / 1.30 / 25	-9.42	n/a
360.021 MHz	46.67 Qp	2.18 / 14.8 / 30.0 / 0.0	33.66	V / 1.00 / 25	-12.34	n/a
380.008 MHz	44.93 Qp	2.25 / 15.37 / 30.0 / 0.0	32.54	V / 1.10 / 0	-13.46	n/a
End of Vertical Scan						
Start of Horizontal Scan						
360.021 MHz	48.0 Qp	2.18 / 14.8 / 30.0 / 0.0	34.99	H / 3.00 / 0	-11.01	n/a
400.017 MHz	41.8 Qp	2.32 / 15.8 / 30.0 / 0.0	29.92	H / 3.00 / 0	-16.08	n/a
228.869 MHz	33.9 Qp	1.72 / 11.34 / 29.77 / 0.0	17.18	H / 3.00 / 0	-28.82	n/a
247.95 MHz	35.75 Qp	1.82 / 12.0 / 29.75 / 0.0	19.82	H / 3.00 / 0	-26.18	n/a
Start of Maximizing.						
360.021 MHz	50.36 Qp	2.18 / 14.8 / 30.0 / 0.0	37.35	H / 3.00 / 125	-8.65	n/a
400.017 MHz	44.08 Qp	2.32 / 15.8 / 30.0 / 0.0	32.2	H / 2.80 / 240	-13.8	n/a
End of Horizontal Scan						
Channel 37						

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Greg S Jakubowski
 Signature

Reviewed by: Joel T Schneider
 Printed

Joel T. Schneider
 Signature

RADIATED EMISSIONS



America

Test Report #: WC807706 Run 5 Test Area: LTS

EUT Model #: 50001558-01 Date: 9/23/2008, 10/7/2008

EUT Serial #: 0000x EUT Power: 3.3 VDC Temperature: 24.0 °C

Test Method: FCC 15.407, 15.209 Air Pressure: 99.0 kPa

Customer: Digi Rel. Humidity: 62.0 %


EUT Description: Connect Wi-EM (Embedded radio module)

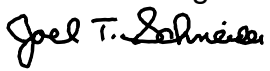
Notes: _____

Data File Name: 7706.dat Page: 3 of 5

List of measurements for run #: 5

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.209 <1GHz 3m	DELTA2
340.008 MHz	49.86 Qp	2.14 / 14.39 / 30.0 / 0.0	36.4	V / 1.20 / 25	-9.6	n/a
360.021 MHz	50.66 Qp	2.18 / 14.8 / 30.0 / 0.0	37.65	H / 3.00 / 125	-8.35	n/a
280.024 MHz	34.25 Qp	1.91 / 12.55 / 29.82 / 0.0	18.89	V / 1.00 / 0	-27.11	n/a
Channel 149						
Channel 157						
Channel 161						
No new or higher emissions detected in either polarization at all azimuths.						
07 October 2008, Greg Jakubowski						
Repeated above with PCB antenna						
No higher emissions detected						
End of Scan 30 - 1000MHz.						

Tested by: Greg S Jakubowski  _____
Printed Signature

Reviewed by: Joel T Schneider  _____
Printed Signature

RADIATED EMISSIONS



Test Report #: WC807706 Run 5 Test Area: LTS
 EUT Model #: 50001558-01 Date: 9/23/2008, 10/7/2008
 EUT Serial #: 0000x EUT Power: 3.3 VDC Temperature: 24.0 °C
 Test Method: FCC 15.407, 15.209 Air Pressure: 99.0 kPa
 Customer: Digi Rel. Humidity: 62.0 %
 EUT Description: Connect Wi-EM (Embedded radio module)

Notes: _____

Data File Name: 7706.dat

Page: 4 of 5

Measurement summary for limit1: FCC-B 15.209 <1GHz 3m (Qp)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.209 <1GHz 3m
360.021 MHz	50.66 Qp	2.18 / 14.8 / 30.0 / 0.0	37.65	H / 3.00 / 125	-8.35
340.008 MHz	50.04 Qp	2.14 / 14.39 / 30.0 / 0.0	36.58	V / 1.30 / 25	-9.42
33.96 MHz	40.4 Qp	0.69 / 19.08 / 30.0 / 0.0	30.17	V / 1.00 / 0	-9.83
380.008 MHz	44.93 Qp	2.25 / 15.37 / 30.0 / 0.0	32.54	V / 1.10 / 0	-13.46
400.017 MHz	44.08 Qp	2.32 / 15.8 / 30.0 / 0.0	32.2	H / 2.80 / 240	-13.8
75.626 MHz	41.9 Qp	0.98 / 8.3 / 29.7 / 0.0	21.48	V / 1.00 / 0	-18.52
449.759 MHz	38.15 Qp	2.49 / 16.49 / 30.01 / 0.0	27.12	V / 1.00 / 90	-18.88
320.027 MHz	40.4 Qp	2.1 / 13.78 / 29.91 / 0.0	26.37	V / 1.00 / 0	-19.63
480.012 MHz	36.45 Qp	2.58 / 16.8 / 30.2 / 0.0	25.63	V / 1.00 / 0	-20.37
420.003 MHz	36.25 Qp	2.39 / 16.13 / 30.0 / 0.0	24.78	V / 1.00 / 180	-21.22
562.172 MHz	34.0 Qp	2.75 / 18.15 / 30.17 / 0.0	24.73	V / 1.00 / 270	-21.27
674.637 MHz	32.05 Qp	3.05 / 19.79 / 30.2 / 0.0	24.69	V / 1.00 / 0	-21.31
108.795 MHz	40.85 Qp	1.15 / 9.18 / 29.7 / 0.0	21.48	V / 1.00 / 0	-22.02
560.013 MHz	32.25 Qp	2.75 / 18.1 / 30.18 / 0.0	22.92	V / 1.00 / 0	-23.08
137.743 MHz	39.35 Qp	1.34 / 8.57 / 29.7 / 0.0	19.56	V / 1.00 / 180	-23.94
383.406 MHz	34.4 Qp	2.26 / 15.34 / 30.0 / 0.0	22.0	V / 1.00 / 0	-24.0
200.01 MHz	36.75 Qp	1.61 / 10.6 / 29.8 / 0.0	19.16	V / 1.00 / 180	-24.34
192.102 MHz	36.1 Qp	1.59 / 10.76 / 29.8 / 0.0	18.64	V / 1.00 / 0	-24.86
168.659 MHz	37.55 Qp	1.52 / 9.01 / 29.8 / 0.0	18.28	V / 1.00 / 0	-25.22
247.95 MHz	35.75 Qp	1.82 / 12.0 / 29.75 / 0.0	19.82	H / 3.00 / 0	-26.18
280.024 MHz	34.25 Qp	1.91 / 12.55 / 29.82 / 0.0	18.89	V / 1.00 / 0	-27.11
160.06 MHz	35.2 Qp	1.5 / 8.97 / 29.8 / 0.0	15.87	V / 1.00 / 0	-27.63
228.869 MHz	33.9 Qp	1.72 / 11.34 / 29.77 / 0.0	17.18	H / 3.00 / 0	-28.82
240.005 MHz	33.35 Qp	1.78 / 11.73 / 29.7 / 0.0	17.16	V / 1.00 / 0	-28.84
253.804 MHz	31.25 Qp	1.83 / 12.21 / 29.78 / 0.0	15.51	V / 1.00 / 270	-30.49
220.01 MHz	32.45 Qp	1.68 / 11.03 / 29.8 / 0.0	15.35	V / 1.00 / 0	-30.65

Tested by: Greg S Jakubowski
Printed

Greg S Jakubowski

 Signature

Reviewed by: Joel T Schneider
Printed

Joel T Schneider

 Signature

RADIATED EMISSIONS



America

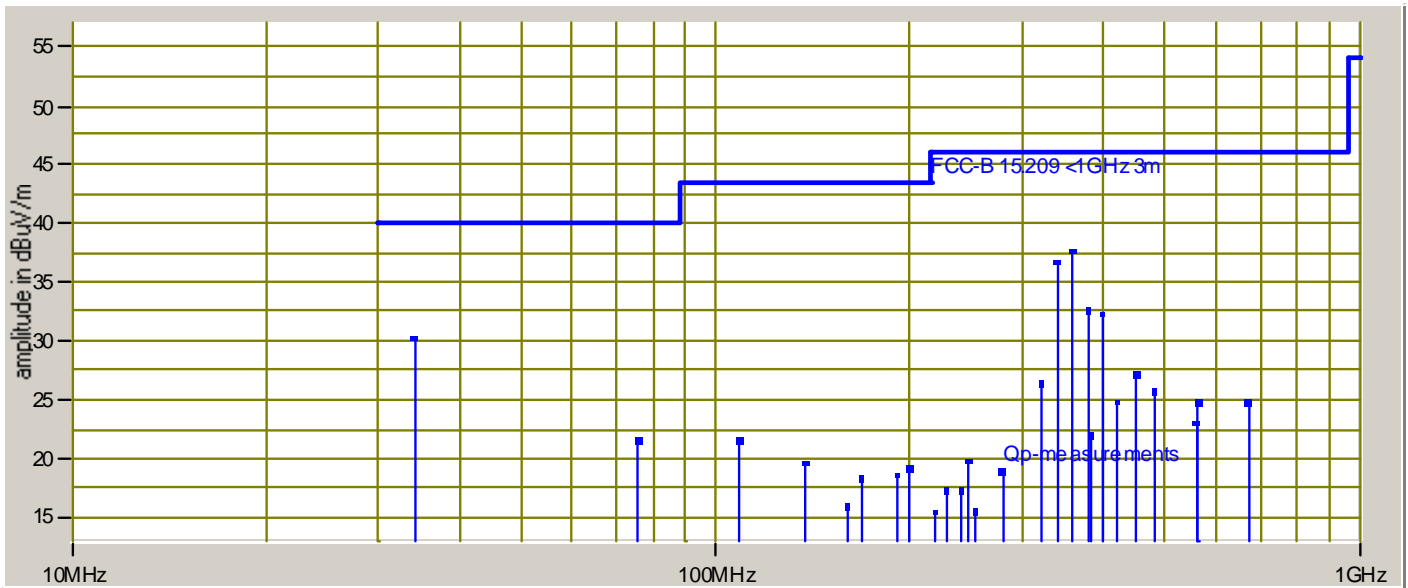
Test Report #: WC807706 Run 5 Test Area: LTS
 EUT Model #: 50001558-01 Date: 9/23/2008, 10/7/2008
 EUT Serial #: 0000x EUT Power: 3.3 VDC Temperature: 24.0 °C
 Test Method: FCC 15.407, 15.209 Air Pressure: 99.0 kPa
 Customer: Digi Rel. Humidity: 62.0 %

EUT Description: Connect Wi-EM (Embedded radio module)

Notes: _____

Data File Name: 7706.dat Page: 5 of 5

Graph:



Tested by: Greg S Jakubowski *Greg S Jakubowski*
 Printed Signature
 Reviewed by: Joel T Schneider *Joel T. Schneider*
 Printed Signature

RADIATED EMISSIONS



Test Report #: WC807706 Run 3 (PCB) Test Area: LTS
 EUT Model #: 50001558-01 Date: 10/7/2008
 EUT Serial #: 0000x EUT Power: 3.3 VDC Temperature: 23.0 °C
 Test Method: FCC 15.407 spurious Air Pressure: 98.0 kPa
 Customer: Digi International Rel. Humidity: 45.0 %

EUT Description: Connect WiEM 9210 a/b/g, 802.11 a/b/g embedded radio module with 29000147 PCB antenna

Notes: _____

Data File Name: 7706.dat Page: 1 of 5

List of measurements for run #: 3

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.209 3m avg	DELTA2 FCC 15.407 - 27dBm eirp 3m pk
Begin spurious emissions scan 1-18GHz						
Average limit per 15.209 for emissions in the restricted bands per 15.205						
-20 dB duty cycle relaxation can apply to average measurements, 10% worst case duty cycle						
Peak limit per 15.407 (-27 dBm eirp = 68.2 dBuV/m @ 3m)						
Power setting 40, 54 Mbps						
PCB antenna						
Upright position produces highest fundamental field strength maximized						
ch 34						
10.34 GHz	53.15 Pk	16.62 / 38.17 / 41.64 / 1.44	67.74	V / 1.58 / 287	na	-0.46
ch 48						
10.48 GHz	50.15 Pk	16.77 / 38.25 / 41.58 / 1.16	64.76	V / 1.58 / 285	na	-3.44
ch 149						
11.49 GHz	40.55 Av	17.83 / 38.88 / 41.31 / 4.66	60.61	V / 1.57 / 330	6.61	n/a
11.49 GHz	47.35 Pk	17.83 / 38.88 / 41.31 / 4.66	67.41	V / 1.55 / 332	na	-0.79
< 6 dB from noise floor						
distance reduced to 1 meter						
~2 dB improvement, back to 3 meters						
ch 157						
11.57 GHz	40.28 Av	17.91 / 38.93 / 41.29 / 4.58	60.41	V / 1.57 / 330	6.41	n/a
11.57 GHz	46.7 Pk	17.91 / 38.93 / 41.29 / 4.58	66.83	V / 1.57 / 330	na	-1.37
ch 161						
11.61 GHz	39.8 Av	17.96 / 38.96 / 41.28 / 4.35	59.78	V / 1.55 / 333	5.78	n/a

Tested by: Greg Jakubowski
Printed

Signature

Reviewed by: Joel T Schneider
Printed

Signature

RADIATED EMISSIONS



America

Test Report #: WC807706 Run 3 (PCB) Test Area: LTS

EUT Model #: 50001558-01 Date: 10/7/2008

EUT Serial #: 0000x EUT Power: 3.3 VDC Temperature: 23.0 °C

Test Method: FCC 15.407 spurious Air Pressure: 98.0 kPa

Customer: Digi International Rel. Humidity: 45.0 %


EUT Description: Connect WiEM 9210 a/b/g, 802.11 a/b/g embedded radio module with 29000147 PCB antenna

Notes: _____

Data File Name: <u>7706.dat</u>	Page:	2 of 5
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List of measurements for run #: 3

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.209 3m avg	DELTA2 FCC 15.407 - 27dBm eirp 3m pk
11.61 GHz	47.2 Pk	17.96 / 38.96 / 41.28 / 4.35	67.18	V / 1.55 / 333	na	-1.02
Begin scan 18-40 GHz						
channel 34						
EUT rotated 360 degrees, measurement antenna 1-4 meters high, vertical & horizontal						
No significant emissions detected						
Repeat with channels 48, 149, 157, 161						
No significant emissions detected						
End scan 1 - 40 GHz						

Tested by: Greg Jakubowski  _____
Printed Signature

Reviewed by: Joel T Schneider  _____

by: _____
Printed Signature

RADIATED EMISSIONS



Test Report #: WC807706 Run 3 (PCB) Test Area: LTS
 EUT Model #: 50001558-01 Date: 10/7/2008
 EUT Serial #: 0000x EUT Power: 3.3 VDC Temperature: 23.0 °C
 Test Method: FCC 15.407 spurious Air Pressure: 98.0 kPa
 Customer: Digi International Rel. Humidity: 45.0 %

EUT Description: Connect WiEM 9210 a/b/g, 802.11 a/b/g embedded radio module with 29000147 PCB antenna

Notes: _____

Data File Name: 7706.dat

Page: 3 of 5

Original average measurements without duty cycle relaxation. Tx on 100%

Measurement summary for limit1: FCC 15.209 3m avg (Av)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.209 3m avg
11.4 GHz	41.62 Av	17.74 / 38.83 / 41.34 / 4.35	61.2	V / 1.69 / 339	7.2
11.49 GHz	40.55 Av	17.83 / 38.88 / 41.31 / 4.66	60.61	V / 1.57 / 330	6.61
11.57 GHz	40.28 Av	17.91 / 38.93 / 41.29 / 4.58	60.41	V / 1.57 / 330	6.41
11.61 GHz	39.8 Av	17.96 / 38.96 / 41.28 / 4.35	59.78	V / 1.55 / 333	5.78

Calculated average. Peak - 20 dB relaxation, 10% worst case duty cycle

Measurement summary for limit1: FCC 15.209 3m avg (Av)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN / CORRECTION (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA1 FCC 15.209 3m avg
11.4 GHz	48.45 Pk	17.74 / 38.83 / 41.34 / 4.35 / 20	48.03	V / 1.69 / 339	-5.97
10.34 GHz	53.15 Pk	16.62 / 38.17 / 41.64 / 1.44 / 20	47.74	V / 1.58 / 287	-6.26
11.49 GHz	47.35 Pk	17.83 / 38.88 / 41.31 / 4.66 / 20	47.41	V / 1.55 / 332	-6.59
11.61 GHz	47.2 Pk	17.96 / 38.96 / 41.28 / 4.35 / 20	47.18	V / 1.55 / 333	-6.82
11.57 GHz	46.7 Pk	17.91 / 38.93 / 41.29 / 4.58 / 20	46.83	V / 1.57 / 330	-7.17
10.48 GHz	50.15 Pk	16.77 / 38.25 / 41.58 / 1.16 / 20	44.76	V / 1.58 / 285	-9.24

Tested by: Greg Jakubowski
 Printed

Signature

Reviewed by: Joel T Schneider
 Printed

Signature

RADIATED EMISSIONS



Test Report #: WC807706 Run 3 (PCB) Test Area: LTS
 EUT Model #: 50001558-01 Date: 10/7/2008
 EUT Serial #: 0000x EUT Power: 3.3 VDC Temperature: 23.0 °C
 Test Method: FCC 15.407 spurious Air Pressure: 98.0 kPa
 Customer: Digi International Rel. Humidity: 45.0 %


EUT Description: Connect WiEM 9210 a/b/g, 802.11 a/b/g embedded radio module with 29000147 PCB antenna

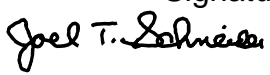
Notes: _____

Data File Name: 7706.dat Page: 4 of 5

Measurement summary for limit2: FCC 15.407 -27dBm eirp 3m pk (Pk)

FREQ	LEVEL (dBuV)	CABLE / ANT / PREAMP / ATTEN (dB)	FINAL (dBuV / m)	POL / HGT / AZ (m)(DEG)	DELTA2 FCC 15.407 - 27dBm eirp 3m pk
11.4 GHz	48.45 Pk	17.74 / 38.83 / 41.34 / 4.35	68.03	V / 1.69 / 339	-0.17
10.34 GHz	53.15 Pk	16.62 / 38.17 / 41.64 / 1.44	67.74	V / 1.58 / 287	-0.46
11.49 GHz	47.35 Pk	17.83 / 38.88 / 41.31 / 4.66	67.41	V / 1.55 / 332	-0.79
11.61 GHz	47.2 Pk	17.96 / 38.96 / 41.28 / 4.35	67.18	V / 1.55 / 333	-1.02
11.57 GHz	46.7 Pk	17.91 / 38.93 / 41.29 / 4.58	66.83	V / 1.57 / 330	-1.37
10.48 GHz	50.15 Pk	16.77 / 38.25 / 41.58 / 1.16	64.76	V / 1.58 / 285	-3.44

Tested by: Greg Jakubowski 
 Printed Signature

Reviewed by: Joel T Schneider 
 Printed Signature

RADIATED EMISSIONS



America

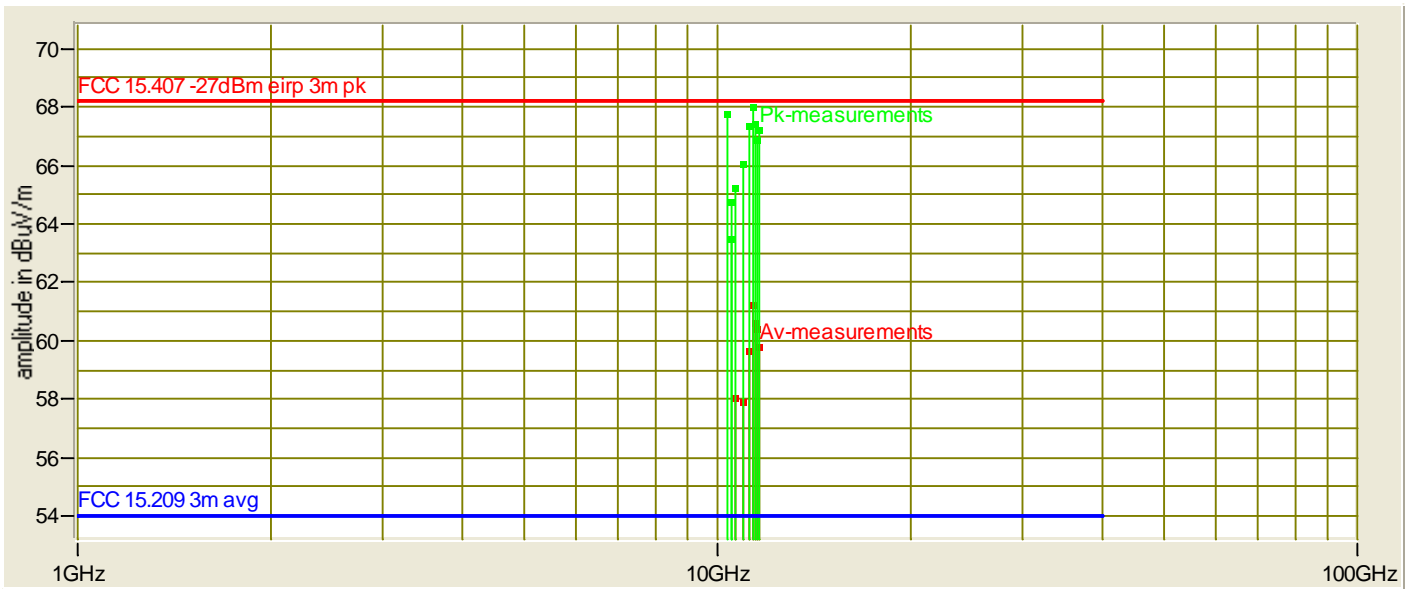
Test Report #: <u>WC807706 Run 3 (PCB)</u>	Test Area: <u>LTS</u>
EUT Model #: <u>50001558-01</u>	Date: <u>10/7/2008</u>
EUT Serial #: <u>0000x</u>	EUT Power: <u>3.3 VDC</u>
Temperature: <u>23.0</u> °C	
Test Method: <u>FCC 15.407 spurious</u>	Air Pressure: <u>98.0</u> kPa
Customer: <u>Digi International</u>	Rel. Humidity: <u>45.0</u> %

EUT Description: Connect WiEM 9210 a/b/g, 802.11 a/b/g embedded radio module with 29000147 PCB antenna

Notes: _____

Data File Name: <u>7706.dat</u>	Page: <u>5 of 5</u>
---------------------------------	---------------------

Graph:



Tested by: Greg Jakubowski
Printed

Greg Jakubowski

Signature

Reviewed by: Joel T Schneider
Printed

Joel T. Schneider

Signature

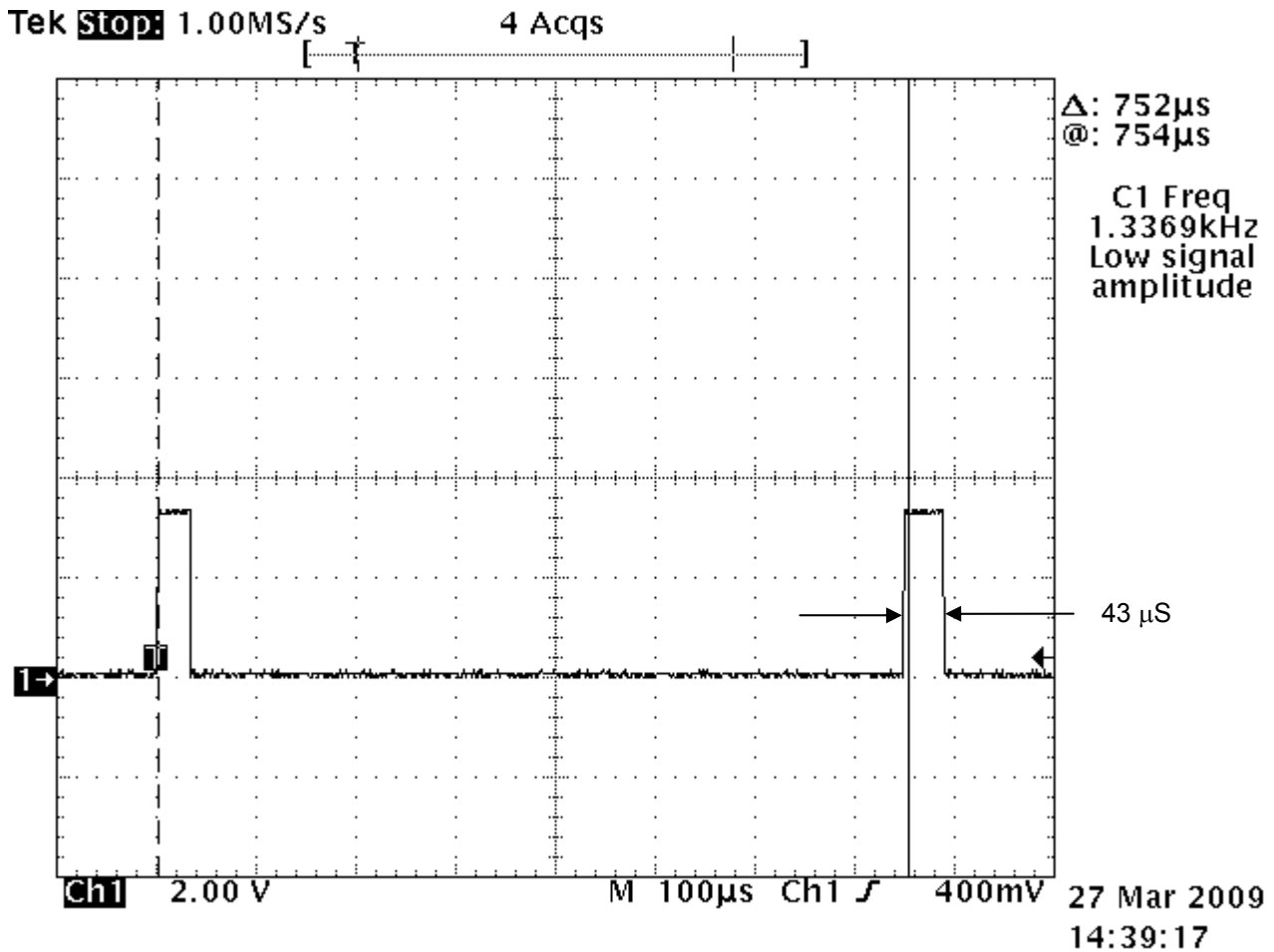
Duty Cycle

Test summary

Manufacturer's data.

Pulses are $43\ \mu\text{S}$ every $752\ \mu\text{S}$. $43/752 = 5.72\%$ duty cycle

Use 10% duty cycle as worst case scenario



Bandedge
Channel 36, power setting 40

* Agilent 15:12:51 Mar 12, 2009

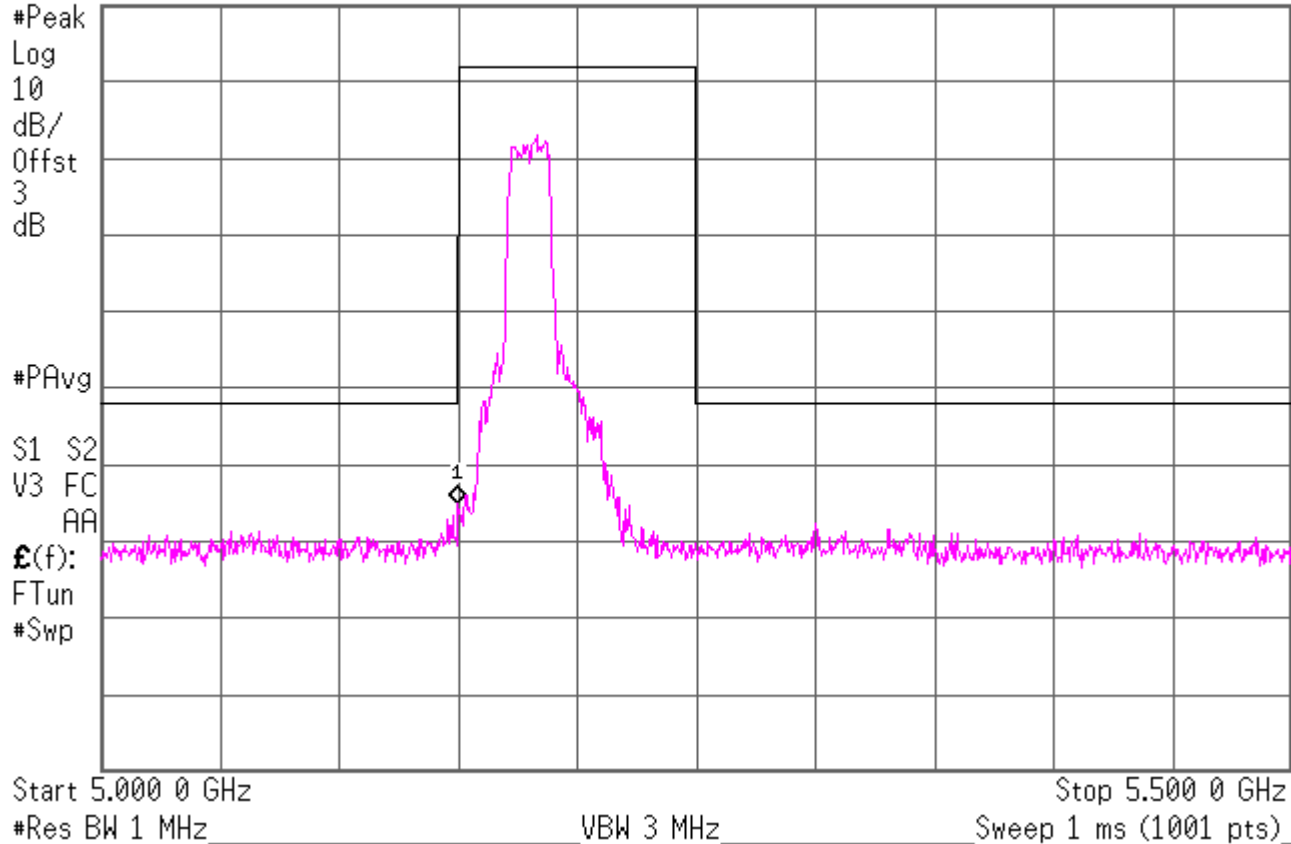
Offset = 1dB cable + 2dBi PCB antenna

Mkr1 5.150 0 GHz

Ref 25 dBm

#Atten 34 dB

-40.00 dBm



5.15 MHz Peak conducted bandedge level = -40 dBm

Peak calculated radiated field strength = 55.23 dB μ V/m at 3 meters

Average radiated field strength limit = 54 dB μ V/m at 3 meters

55.23 dB μ V/m peak at 3 meters – 24 dB duty cycle correction = 31.23 dB μ V/m, 22.7 dB below the average limit

Bandedge
Channel 149, power setting 40

* Agilent 13:48:42 Sep 18, 2008

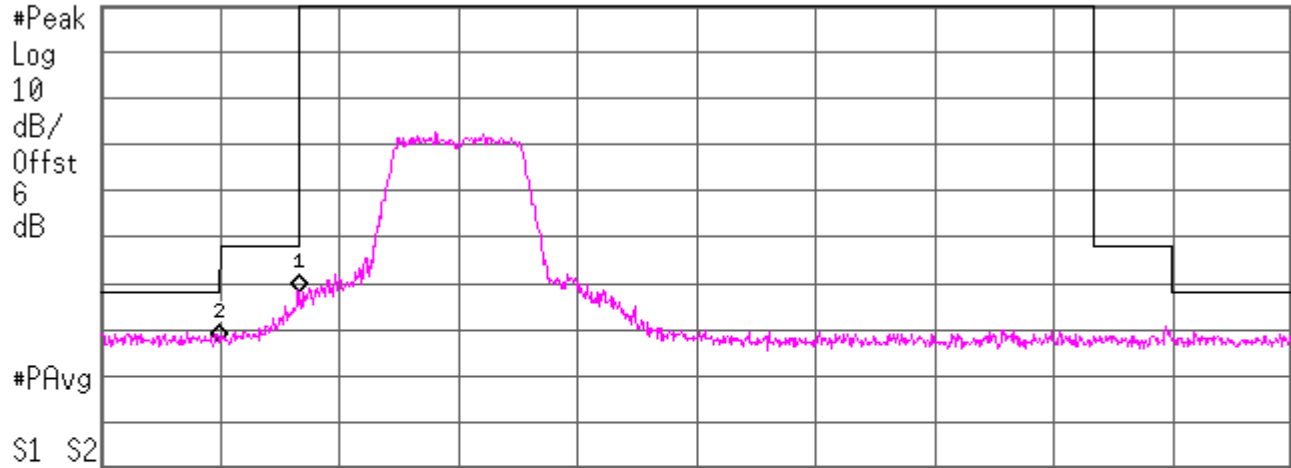
Offset = 1dB cable + 5dBi antenna

Mkr2 5.715 0 GHz

Ref 35 dBm

Atten 40 dB

-37.53 dBm



Start 5.700 0 GHz

Stop 5.850 0 GHz

#Res BW 1 MHz

VBW 3 MHz

Sweep 1 ms (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(3)	Freq	5.725 0 GHz	-26.90 dBm
2	(3)	Freq	5.715 0 GHz	-37.53 dBm

Bandedge
Channel 161, power setting 40

* Agilent 13:49:44 Sep 18, 2008

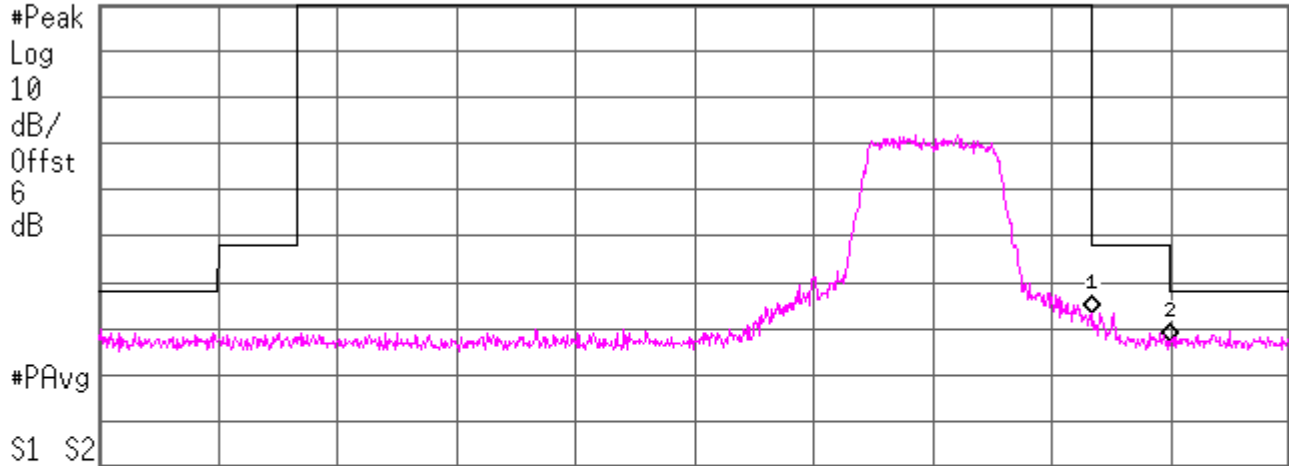
Offset = 1dB cable + 5dBi antenna

Mkr2 5.835 0 GHz

Ref 35 dBm

Atten 40 dB

-37.71 dBm



Start 5.700 0 GHz

Stop 5.850 0 GHz

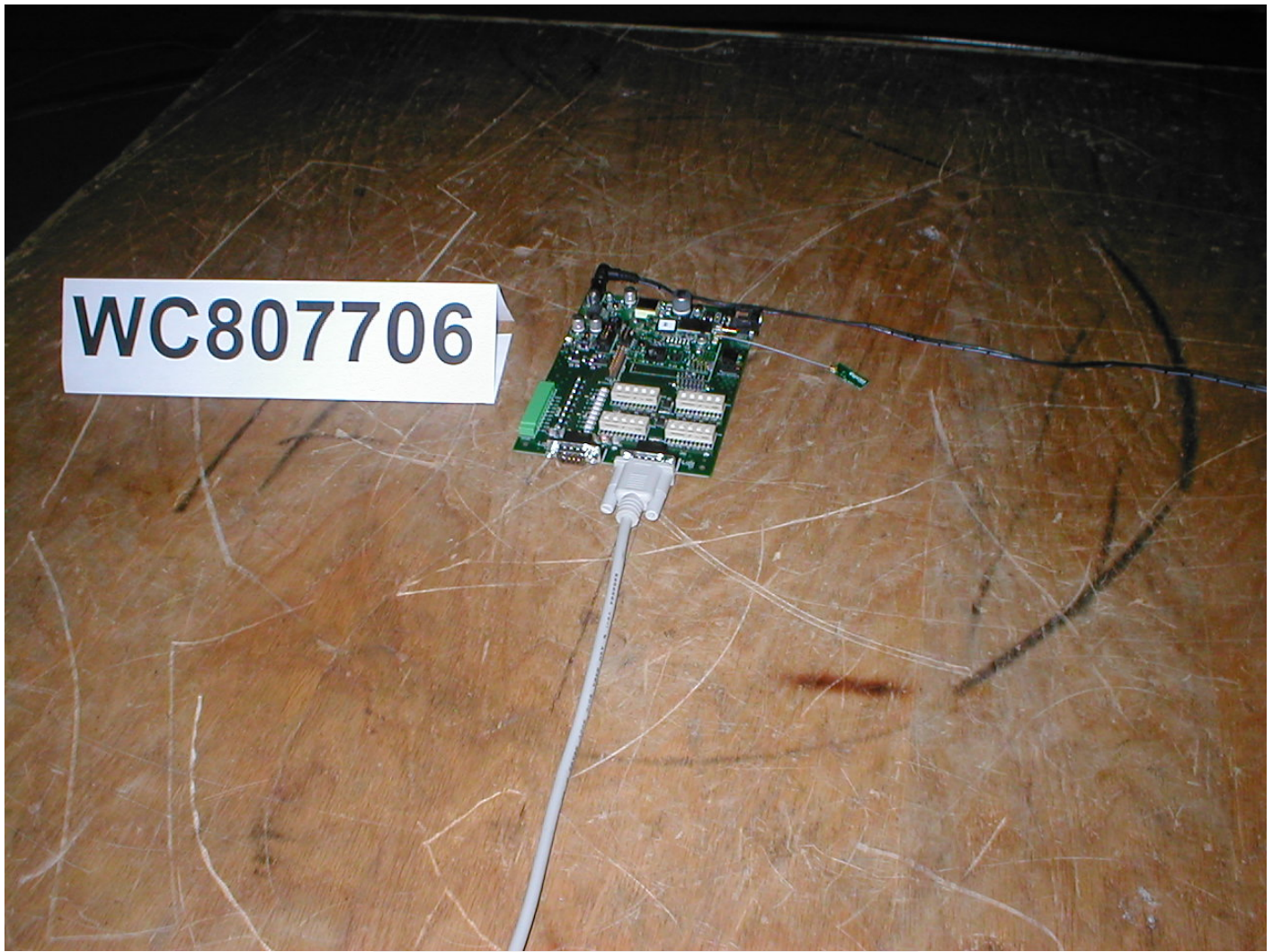
#Res BW 1 MHz

VBW 3 MHz

Sweep 1 ms (1001 pts)

Marker	Trace	Type	X Axis	Amplitude
1	(3)	Freq	5.825 0 GHz	-31.59 dBm
2	(3)	Freq	5.835 0 GHz	-37.71 dBm

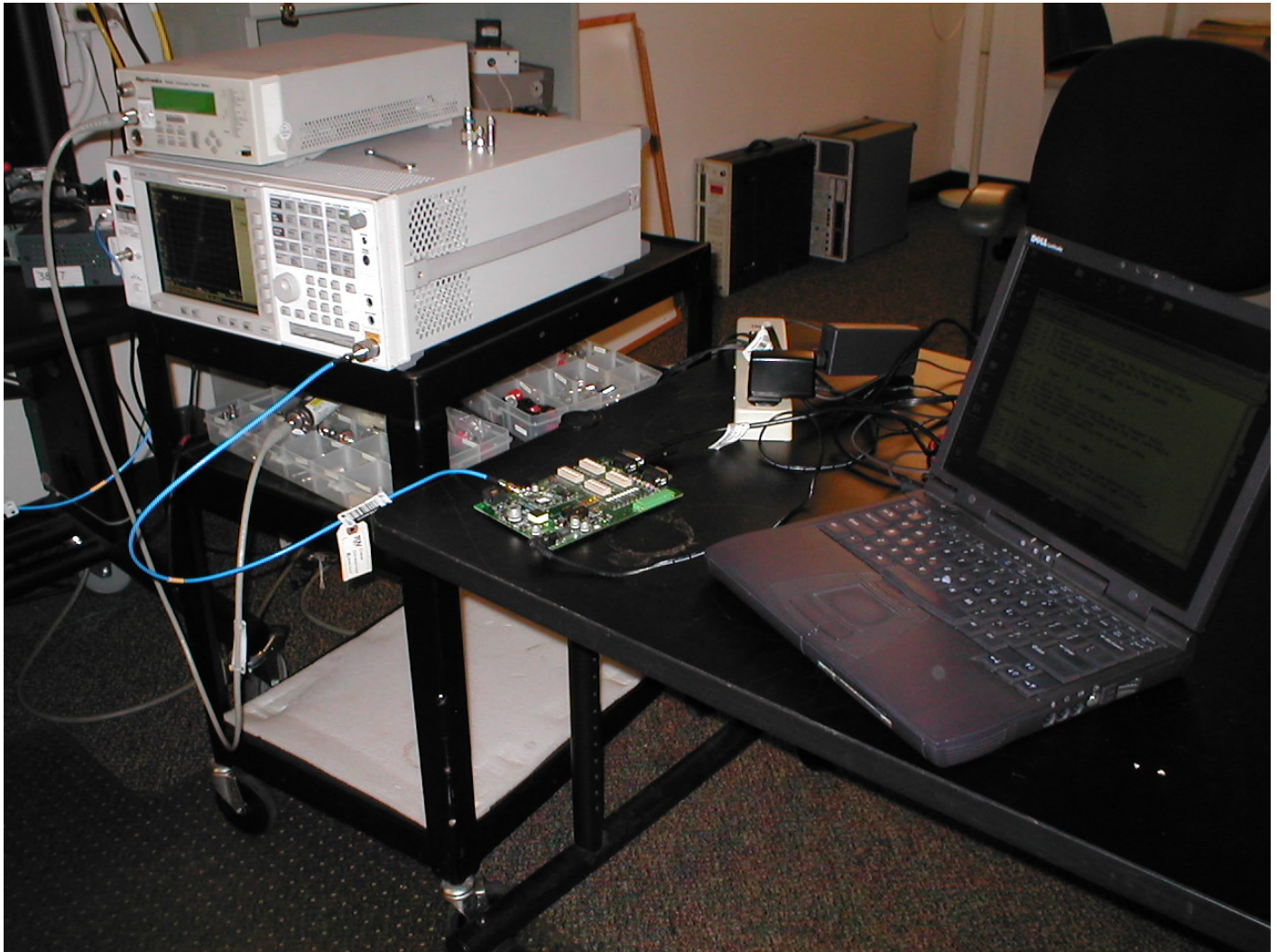
Test-setup photo(s):
Radiated measurements



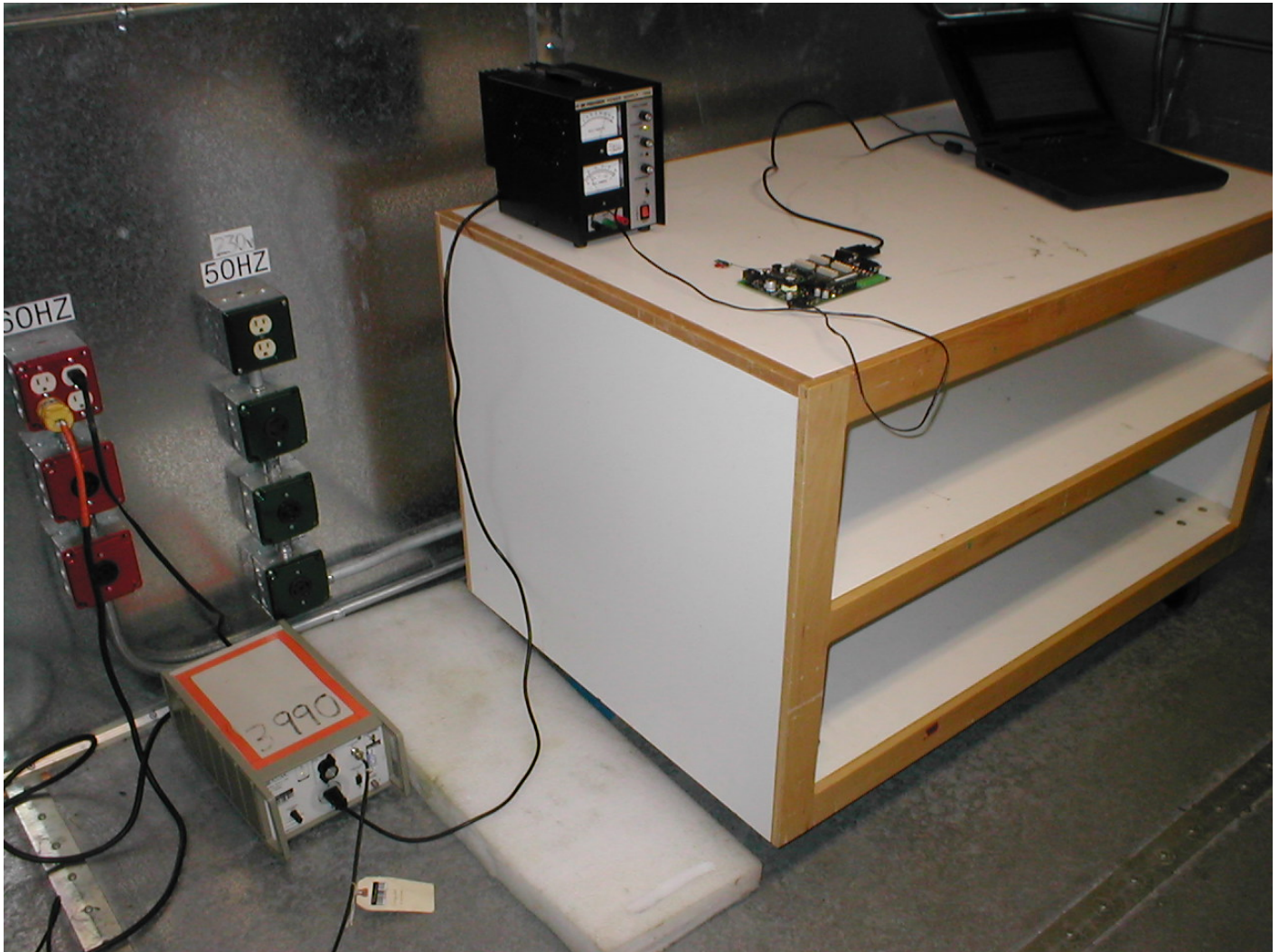
Test-setup photo(s):
Radiated measurements



Test-setup photo(s):
Conducted measurements



Test-setup photo(s):
Conducted measurements – AC power lines



Equipment Under Test (EUT) Test Operation Mode:

The device under test was operated under the following conditions during emissions testing:

- Standby
 - Test program (H - Pattern)
 - Test program (color bar)
 - Test program (customer specific)
 - Practice operation
 - Normal Operating Mode
 - See Software and/or Operating Modes in Appendix A
-

Configuration of the device under test:

- See Constructional Data Form and Block Diagram in Appendix A
- See Product Information Form in Appendix B

GENERAL REMARKS:

None

Modifications required to pass:

- None
- As indicated on the data sheet(s)

Test Specification Deviations: Additions to or Exclusions from:

- None
- As indicated in the Test Plan
-

SUMMARY:

The requirements according to the technical regulations are

- met and the equipment under test does fulfill the general approval requirements.
- **not** met and the equipment under test does **not** fulfill the general approval requirements.

EUT Received Date: 15 September 2008
Condition of EUT: Normal
Testing Start Date: 15 September 2008
Testing End Date: 26 March 2009

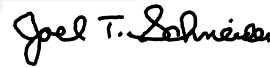
TÜV SÜD AMERICA INC

Tested by:



Greg S Jakubowski
Senior EMC Technician

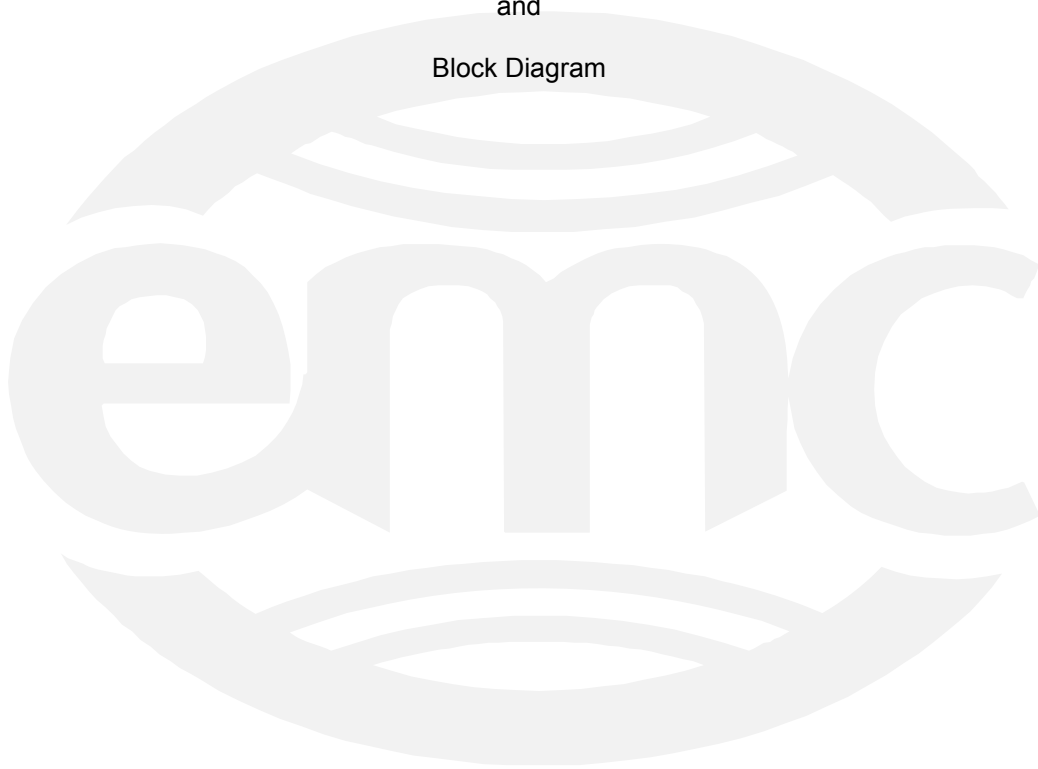
Approved by:



Joel T Schneider
Senior EMC Engineer

Appendix A

Constructional Data Form
and
Block Diagram





EMC Test Plan and Constructional Data Form

PLEASE COMPLETE THIS DOCUMENT IN FULL, ENTERING N/A IF THE FIELD IS NOT APPLICABLE. IF TESTING RESULTS IN MODIFICATIONS TO THE EQUIPMENT, PLEASE SUBMIT A REVISED TP/CDF INDICATING THOSE MODIFICATIONS.
NOTE: This information will be input into your test report as shown below. Press the F1 key at any time to get HELP for the current field selected.

Company: Digi International
 Address: 11001 Bren Road East
Minnetonka, MN 55343
 Contact: Slava Gekht Position: Hardware Engineer
 Phone: 952-912-3245 Fax: _____
 E-mail Address: slava.gekht@digi.com

General Equipment Description -- NOTE: This information will be input into your test report as shown below.

EUT Description 802.11 a/b/g embedded radio module (802.11 a/b/g to a serial port converter module)
 EUT Name WiEM 9210 a/b/g
 Model No.: 50001558-01 Serial No.: 0000x
 Product Options: Antenna options: 29000147
 Configurations to be tested: 29000147

Equipment Modification (If applicable, indicate modifications since EUT was last tested. If modifications are made during this testing, submit revised TP/CDF after testing is complete.)

Modifications since last test: _____
 Modifications made during test: _____

Test Objective(s): Please indicate the tests to be performed, entering the applicable standard(s) where noted.

- | | |
|---|--|
| <input checked="" type="checkbox"/> EMC Directive 2004/108/EC (EMC)
Std: _____ | <input checked="" type="checkbox"/> FCC: Class <input type="checkbox"/> A <input checked="" type="checkbox"/> B Part _____ |
| <input type="checkbox"/> Machinery Directive 89/392/EEC (EMC)
Std: _____ | <input type="checkbox"/> VCCI: Class <input type="checkbox"/> A <input type="checkbox"/> B |
| <input type="checkbox"/> Medical Device Directive 93/42/EEC (EMC)
Std: _____ | <input type="checkbox"/> BSMI: Class <input type="checkbox"/> A <input type="checkbox"/> B (Separate Report) |
| <input type="checkbox"/> Vehicle Directive: <input type="checkbox"/> 2001/3/EC (EMC) <input type="checkbox"/> 2004/104/EC (EMC) | <input type="checkbox"/> Canada: Class <input type="checkbox"/> A <input type="checkbox"/> B |
| <input type="checkbox"/> Other Vehicle Std: _____ | <input type="checkbox"/> Australia: Class <input type="checkbox"/> A <input type="checkbox"/> B |
| <input type="checkbox"/> FDA Reviewers Guidance for Premarket Notification Submissions (EMC) | <input checked="" type="checkbox"/> Other: <u>RTTE 1999/5/EC</u> |

Third Party Certification, if applicable (*Signature on Page 6 Required)

- | | |
|--|---|
| <input type="checkbox"/> Attestation of Conformity (AoC)* | <input type="checkbox"/> EMC Certification (used with Octagon Mark)* |
| <input type="checkbox"/> Certificate of Conformity (CoC)*
Protection Class (N/A for vehicles) | <input type="checkbox"/> Compliance Document* |
| (Press F1 when field is selected to show additional information on Protection Class.) | <input type="checkbox"/> Class I <input type="checkbox"/> Class II <input type="checkbox"/> Class III |
| <input checked="" type="checkbox"/> FCC / TCB Certification | <input type="checkbox"/> Industry Canada / FCB Certification |
| <input type="checkbox"/> E-Mark Certification | <input type="checkbox"/> Taiwan Certification |



EMC Test Plan and Constructional Data Form

Attendance

Test will be: Attended by the customer Unattended by the customer

Failure - Complete this section if testing will not be attended by the customer.

If a failure occurs, TÜV SÜD America should:

- Call contact listed above, if not available then stop testing. (After hrs phone): _____
- Continue testing to complete test series.
- Continue testing to define corrective action.
- Stop testing.

EUT Specifications and Requirements

Length: 1.935" Width: 1.855" Height: 0.0653" Weight: _____

Power Requirements

Regulations require testing to be performed at typical power ratings in the countries of intended use. (i.e., European power is typically 230 VAC 50 Hz or 400 VAC 50 Hz, single and three phase, respectively)

Voltage: 3.3V (If battery powered, make sure battery life is sufficient to complete testing.)

of Phases: 1

Current (Amps/phase(max)): 0.62 Current (Amps/phase(nominal)): 0.4

Other _____

Other Special Requirements

Run radiated and conducted immunity at 10 V/m.

Typical Installation and/or Operating Environment

(ie. Hospital, Small Business, Industrial/Factory, etc.)
Industrial and small business

EUT Power Cable

- Permanent OR Removable Length (in meters): _____
- Shielded OR Unshielded
- Not Applicable



EMC Test Plan and Constructional Data Form

EUT Interface Ports and Cables														
Type	Analog	Digital	During Test		Qty	Shielding		Termination	Connector Type	Port Termination	Length tested (in meters)	Removable	Permanent	
			Active	Passive		Yes	No							Type
EXAMPLE: RS232	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Foil over braid	Coaxial	Metallized 9-pin D-Sub	Characteristic Impedance	6	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Serial Cable	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	2	<input checked="" type="checkbox"/>	<input type="checkbox"/>	Foil over braid	Connector Shell			1	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		<input type="checkbox"/>	<input type="checkbox"/>						<input type="checkbox"/>	<input type="checkbox"/>



EMC Test Plan and Constructional Data Form

EUT Software.

Revision Level: A

Description: FCC Software - transmits data over wireless interface

Equipment Under Test (EUT) Operating Modes to be Tested -- list the operating modes to be used during test. It is recommended the equipment be tested while operating in a typical operation mode. FCC testing of personal computers and/or peripherals requires that a simple program generate a complete line of upper case H's. Provide a general description of all software, firmware, and PLD algorithms used in the equipment. List all code modules as described above, with the revision level used during testing. Consult with your TÜV Product Service Representative if additional assistance is required.

1. Immunity - UUT associated to Cisco Access Point. Laptop connected to AP through hub, and sending constant 'ping' to radio.

2. Radiated emissions - UUT running code to transmit continuously over wireless interface.

3. Conducted emissions - UUT running FCC code to transmit continuously over wireless interface. Spectrum analyzer connected to primary antenna port.

Equipment Under Test (EUT) System Components -- List and describe all components which are part of the EUT. For FCC & Taiwan testing a minimum configuration is required. (ie. Mouse, Printer, Monitor, External Disk Drive, Motherboard, etc)

Description	Model #	Serial #	FCC ID #



EMC Test Plan and Constructional Data Form

Support Equipment -- List and describe all support equipment which is not part of the EUT. (i.e. peripherals, simulators, etc)
This information is required for FCC & Taiwan testing.

Description	Model #	Serial #	FCC ID #
Access Point	Cisco Aironet 1130AG		
Network Hub	Digi Personal Hub 510H		
Laptop	Micron Transport GX+		
Digi WiEM Development Board	55001095-01 Rev B		

Oscillator Frequencies

Manufacturer	Frequency	Derived Frequency	Component # / Location	Description of Use
	20.000 MHz		20000202 / Y1	Baseband processor, RF transceiver
	29.4912 MHz		21000188 / X1	Microprocessor
	2.4 GHz (PLL)			Radio frequency
	5.0 GHz (PLL)			Radio frequency

Power Supply

Manufacturer	Model #	Serial #	Type
			<input type="checkbox"/> Switched-mode: (Frequency) _____ <input type="checkbox"/> Linear <input type="checkbox"/> Other: _____
			<input type="checkbox"/> Switched-mode: (Frequency) _____ <input type="checkbox"/> Linear <input type="checkbox"/> Other: _____

Power Line Filters

Manufacturer	Model #	Location in EUT



EMC Test Plan and Constructional Data Form

Critical EMI Components (Capacitors, ferrites, etc.)				
<i>Description</i>	<i>Manufacturer</i>	<i>Part # or Value</i>	<i>Qty</i>	<i>Component # / Location</i>

EMC Critical Detail -- Describe other EMC Design details used to reduce high frequency noise.

PLEASE ENTER NAMES BELOW (INSERT ELECTRONIC SIGNATURE IF POSSIBLE)

Authorization (Signature Required if a Third Party Certification is checked on pg 1)

Customer authorization to perform tests according to this test plan.

Date

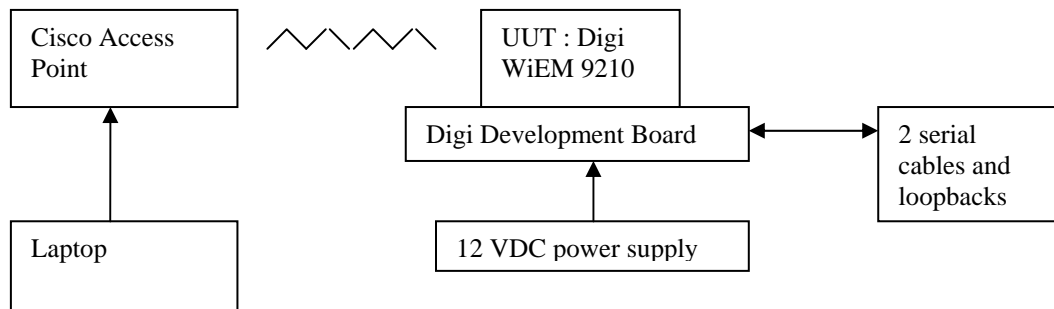
Test Plan/CDF Prepared By (please print)

Date

EMC Block Diagram Form

System Configuration Block Diagram -- Provide a line drawing identifying the EUT, simulators, support equipment, I/O cables, power cables, and any other pertinent components to be used during testing. Use a dashed line to separate the equipment in the testing field versus equipment outside testing field.

NOTE: Cisco Access Point and laptop are only for Immunity test.



Authorization Signatures

Customer authorization to perform tests according to this test plan.

Date

Test Plan/CDF Prepared By (please print)

Date

Appendix B

Measurement Protocol



MEASUREMENT PROTOCOL

GENERAL INFORMATION

Test Methodology

Emissions testing is performed according to the procedures in ANSI C63.4-2003, FCC KDB Publication 558074, the article "The Measurement of Occupied Bandwidth" by Industry Canada's certification bureau, & FCC Public Notice DA 02-2138.

Measurement Uncertainty

The test system for conducted emissions is defined as the LISN, tuned receiver or spectrum analyzer, and coaxial cable. The test system has a measurement uncertainty of ± 1.8 dB. The test system for radiated emissions is defined as the antenna, the pre-amplifier, the spectrum analyzer and the coaxial cable. The test system has a measurement uncertainty of ± 4.8 dB. The equipment comprising the test systems is calibrated on an annual basis.

Justification

The Equipment Under Test (EUT) is configured in a typical user arrangement in accordance with the manufacturer's instructions. A cable is connected to each available port and either terminated with a peripheral into its characteristic impedance or left unterminated. When appropriate, the cables are manually manipulated with respect to each other to obtain maximum emissions from the unit.

Conducted Emissions

Final measurement levels are determined by connecting the antenna port of the DUT to a spectrum analyzer input via coaxial adapters, high frequency coax, and attenuators as necessary. The loss created by the interconnect apparatus is offset by settings within the analyzer. Specific analyzer settings are determined by the procedures throughout this report.

Radiated Emissions

Radiated emissions from the EUT are measured in the frequency range of 30 to 1000 MHz using a spectrum analyzer and appropriate broadband linearly polarized antennas. Measurements between 30 MHz and 1000 MHz are made with 120 kHz/6 dB bandwidth and quasi-peak detection and measurements above 1000 MHz are made with a 1 MHz/6 dB bandwidth, and peak and average detection. The antenna is positioned 3 meters horizontally from the EUT. The antenna height is positioned 1-4 meters above the ground plane. Measurement scans are made with both horizontal and vertical antenna polarizations. Average measurements above 1 GHz are achieved using a peak detector with 1 MHz RBW and 10 Hz VBW with Tx on 100%. Corrected average values calculated by subtracting 20 dB duty cycle relaxation from peak readings based on a 10% worst case duty cycle.

The final level, in $\text{dB}\mu\text{V}/\text{m}$, equals the reading from the spectrum analyzer (Level $\text{dB}\mu\text{V}$), adding the antenna correction factor and cable loss factor (Factor dB) to it, and subtracting the preamp gain (and duty cycle correction factor, if applicable). This result then has the limit subtracted from it to provide the Delta, which gives the tabular data as shown in the data. Intentional radiators are rotated through 3 orthogonal axes to determine the test position yielding the maximum emission levels.

Example:

FREQ (MHz)	LEVEL ($\text{dB}\mu\text{V}$)	CABLE/ANT/PREAMP (dB) (dB/m) (dB)	FINAL ($\text{dB}\mu\text{V}/\text{m}$)	POL/HGT/AZ (m) (deg)	DELTA1
60.80	42.5Qp +	1.2 + 10.9 - 25.5 =	29.1	V 1.0 0.0	-10.9

Test Equipment

All measurement instrumentation is traceable to the National Institute of Standards and Technology and is calibrated according to internal procedure.